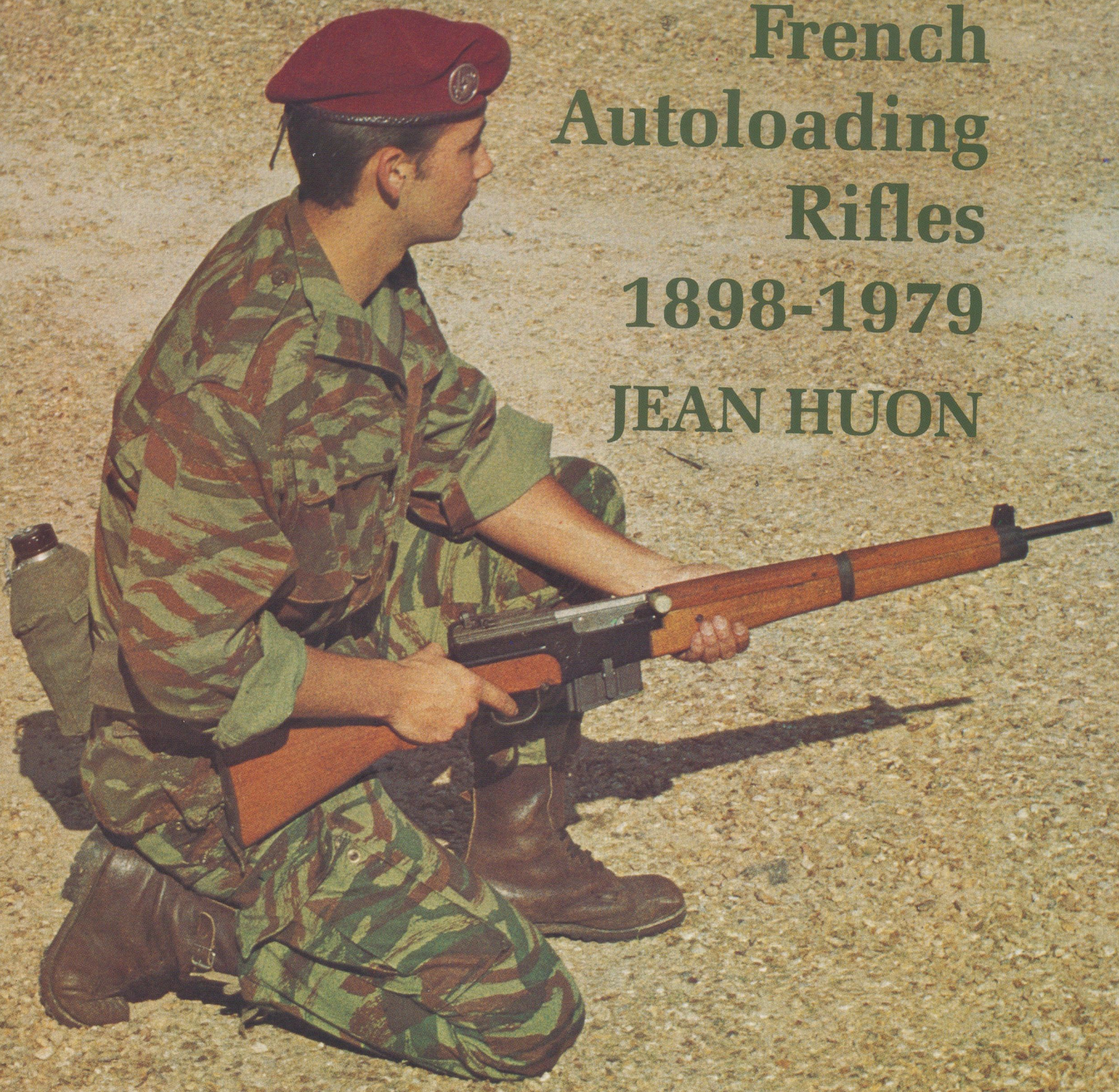
Proud Promise

French Autoloading Rifles 1898-1979

JEAN HUON



Collector Grade Publications
INCORPORATED

A Collector Grade Book

Proud Promise

French Autoloading Rifles 1898 - 1979

by Jean Huon

produced and edited by R Blake Stevens

216 pages
299 illustrations
ISBN 0-88935-186-4

France has always cloaked her military developments, particularly those concerning Ordnance, in a shroud of secrecy. In this, until now, the French have succeeded only too well. Indeed, so little has been known of French arms developments and their impact on other designers that ***Proud Promise*** will literally obsolete everything in your library shelves on the subject of military autoloading rifles and whence they came.

Most students of arms history know that progressive-burning, smokeless gunpowder was invented in France, in 1884, and that France was first in the world to field a rifle and cartridge expressly designed to use it (the bolt-action M1886 Lebel, in calibre 8x50R). When introduced, the 8mm Lebel outranged and outshot every other military rifle in the world.

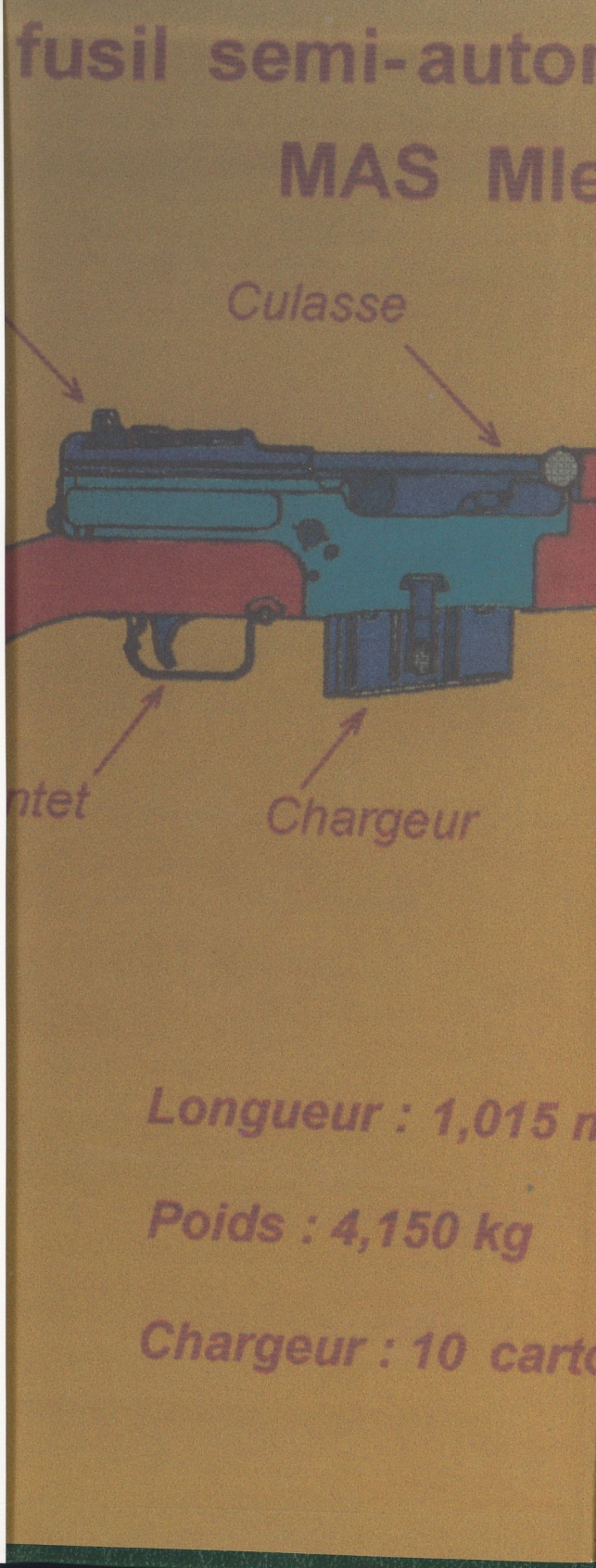
Much less well known are numerous other astounding world firsts which followed this French "first of firsts" in modern arms and cartridge design. Some of these are as follows:

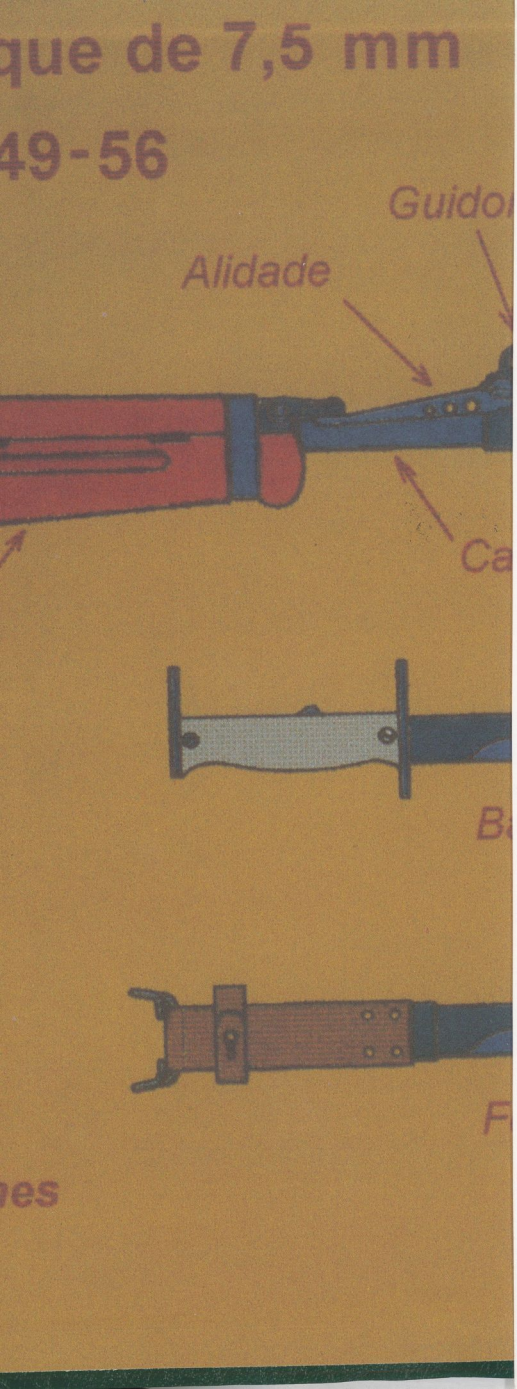
- ***World's first weapons system*** (the ENT Rossignol 6x60mm B1 machine rifle of 1900 and the B1 autoloading rifle of 1901)
- ***World's first issue autoloading rifle to be used in combat*** (the 8mm Lebel calibre M1917)
- ***World's first firing port weapon*** (the 8-shot, 8mm Lebel calibre Ribeyrolles full-auto "machine pistol" of 1918)
- ***World's most advanced arm*** at the end of World War I (the 7x56.95mm Meunier A6 carbine with 15-shot magazine).

These and many more wonders, including two major French inventions which have long been universally misattributed, are expertly described and profusely illustrated within.

Unfortunately, the French *Etat Major* (General Staff) was not run by gun designers, nor were most French politicians willing to face reality and make long-term commitments. In fact, many of the amazing developments described in this book took place *in spite of* the powers governing France, whose dithering saw most French soldiers fight both World Wars with obsolete repeating rifles.

continued on back flap



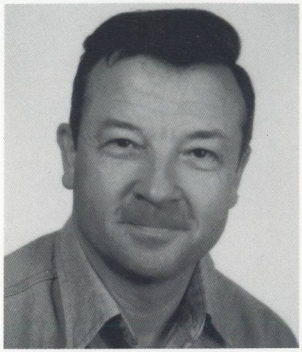


continued from front flap

Proud Promise then describes how hard-won knowledge and experience gained in post-WWI trials with prototype autoloading rifles from all three of France's historic State-owned arsenals—MAS, MAC and MAT—finally bore fruit in the 7.5x54mm MAS 38-39, the first autoloader to match the reliability of the bolt-action MAS 36.

After the bitter years of WWII, renewed development saw the MAS 44 adopted. Combat experiences in Indochina led to the experimental MAS 44 A, further improved in the production MAS 49 and culminating in the MAS 49-56, surely one of the toughest, most compact, and most *effective* semi-automatic rifles in the world (*every* rifle has a built-in grenade launcher, and a telescopic sight base).

Accessories; ammunition; grenades; France's Small Arms Establishment today: an *in-depth* study that will change the way you think about autoloading arms design.



About the Author

Jean Huon was born in 1948, and still lives in a lovely village near Rambouillet, 50km (30 miles) south of Paris, where his family has been established for more than three centuries.

M. Huon studed metallurgy at the St-Lambert School in Paris, and has worked in several related enterprises.

Interested in firearms since childhood, he began to write articles on this theme in 1970. Today, Jean Huon works for the French Justice Department at the Appeal Court of Versailles as a private consultant in firearms identification and related fields.

In addition to being the author of a growing library of specialist gun books published in France, the USA (and Canada!), he has published more than a thousand articles on small arms, ammunition and other military subjects as a Contributing Editor with the following prestigious European and American periodicals:

- *Action Guns*
- *Cibles*
- *Guilliaume Tell*
- *Traditions*
- *Uniformi & Armi*
- *L'Amateur d'Armes*
- *Gazette des Armes*
- *Militaria*
- *Uniformes*
- *Waffen Digest*

Proud Promise

French
Autoloading
Rifles
1898-1979

Proud Promise

French Autoloading Rifles 1898-1979

JEAN HUON

produced and edited by R Blake Stevens

Collector Grade Publications
INCORPORATED

Other Collector Grade Books . . .

Backbone of the Wehrmacht—the German K98k Rifle, 1934 – 1945
(1991; Author's Revised Edition 1993) by Richard D Law

The Black Rifle—M16 Retrospective
(1987; Enhanced Edition 1992) by R Blake Stevens and Edward C Ezell

The Bren Gun Saga
(1986) by Thomas B Dugelby

The Browning High Power Automatic Pistol
(1984; Expanded Edition 1990) by R Blake Stevens

EM-2 Concept & Design—A Rifle Ahead of its Time
(1980) by Thomas B Dugelby

Death from Above—The German FG42 Paratroop Rifle
(1990) by Thomas B Dugelby and R Blake Stevens

The Devil's Paintbrush—Sir Hiram Maxim's Gun
(1989; Revised Edition 1993) by Dolf L Goldsmith

The FAL Rifle
1993 Classic Edition, comprising the three-volume *FAL Series* plus Index:
North American FALs (paper 1979; 10th Anniversary Hardcover Edition 1989) by R Blake Stevens
UK and Commonwealth FALs (paper 1980; 10th Anniversary Hardcover Edition 1989) by R Blake Stevens
The Metric FAL (paper 1981; 10th Anniversary Hardcover Edition 1989) by R Blake Stevens and Jean E Van Rutten
The FAL Series Index (1989) by Eino Sierpe and R Blake Stevens

The Grand Old Lady of No Man's Land—the Vickers Machinegun
(1994) by Dolf L Goldsmith

Honour Bound—the Chauchat Machine Rifle
(1995) by Gerard Demaison and Yves Buffetaut

Modern Military Bullpup Rifles—the EM-2 Concept Comes of Age
(1984) by Thomas B Dugelby

The '03 Era—When Smokeless Revolutionized U.S. Riflery
(1994) by Clark S. Campbell

The SPIW—The Deadliest Weapon that Never Was
(1984) by R Blake Stevens and Edward C Ezell

US Rifle M14—From John Garand to the M21
(1983; reprinted 1988; Revised Edition 1991) by R Blake Stevens

WAR BABY! The US Caliber .30 Carbine
(1992) by Larry L Ruth

WAR BABY Comes Home—The US Carbine Volume II
(1993) by Larry L Ruth

ISBN 0-88935-186-4

Published by Collector Grade Publications Incorporated

PO Box 1046 Cobourg, Ontario Canada K9A 4W5

Printed in Canada

First Edition

Remerciements

With profound gratitude, the author acknowledges the valuable contributions made by the individuals and establishments named hereunder, who have given freely to aid in this research:

M. Jacques Barlerin, *spécialiste des munitions françaises*

M. William Barrow

M. Roger Bosc, *ancien de la 13ème Demi-Brigade de Légion Etrangère*

Centre d'Archives de l'Armement à Châtellerault (CAA):
- M. Fauriel

Ceska Zbrokova, Uhersky Brod (Czechoslovakia):
- M. Ivo Janeba, commercial director

M. Christian Clanet, *Expert Honoraire*

Comptoir Français de l'Arquebuserie, Galerie de Mars, Les Lilas,
- M. Arbousse-Bastide; M Alain Barrellier

CADIMPEX Inc:
- M. Carlos Davila, Editor's Translation Consultant

M. Gerard Demaison, Author, historian and researcher

Ecole Superieure d'Application du Matériel, Bourges

Mr Robert S Eddy III

Melle Cécile Faucon, for correspondence concerning the work of Colonel Faucon

Garde Républicaine:
- M. le *Général* Lorant, Director; M. le *Chef d'Escadron* Grech, exterior relations officer; M. le *Maréchal des Logis Chef* Bague, *vidéo-photo-cinéma*

GIAT Industries (*Manufacture Nationale d'Armes de St-Etienne*)
- M. Bruno Decorsaire; M. Daniel Ploton; M. Grandchamp

GIAT Industries (*Manufacture Nationale d'Armes de Tulle*)
- Mme O Gobert; Mme Miguèle Fabiani

M. Serge Hauteville, *spécialiste des munitions françaises*

Institut National de la Propriété Industrielle (INPI), Paris

Mr Richard Law, Gretna, Louisiana, USA

Lègion Etrangère:
- M. le *Colonel* Terrasson, *Chef du service information et historique*; M. l'*Adjudant-Chef* Glaziou, *Conservateur du Musée*

Librairie de l'Armée de Terre

M. Claude Lombard, Engineer, *Manufacture Nationale d'Armes de Châtellerault*

Marine Nationale:
- M. le *Capitaine* de Vaisseau Bied Charreton, *Commandant* le SIRPA/MER

Ministry of Defence Pattern Room, Nottingham, England:
- Mr Herbert J Woodend, Curator; Mr Howard Mitchell, Librarian

M. Jean-Pierre Montet, du *Club de Tir* d'Hossegore

Multi-Arms, Rambouillet:
- M. Jean-Yves Baron

M. Claude Najan de Bevere, for information on the work of Colonel Faucon

M. Jean-Pierre Paris, *ancien du 11ième Bataillon de Parachutistes de Choc*

M. Fleury Picon, Technician, *Manufacture Nationale d'Armes de St-Etienne*

Dr Philippe Regenstreif, *Expert en Munitions*

M. Jean-Claude Schlinger, *Expert en Armes et Munitions*

Section Technique de l'Armée de Terre:
- M. le *Colonel* Buisson

Service Historique de l'Armée, Château de Vincennes

M. Alain Tomei, *Maître-Armurier*

Universal Arms, Paris:
- Mme Simone Favre

M. François Vauvilliers, *Historien*

Unless otherwise indicated:

All the photographs in this book were taken by the author, and most of the weapons shown are from the collection of the French Army.

Table of Contents

Editor's Foreword

Producing Jean Huon's *Proud Promise* has been a real eyeopener for me. In fact, its publication obsoletes every research title in my library shelves on the subject of autoloading rifles and whence they came.

And that's not necessarily anyone's fault. France has historically cloaked her military developments, particularly those concerning Ordnance, in a shroud of obdurate secrecy. Simply plugging into the purposeful Byzantium of the French archival system itself has flummoxed many a native-born researcher, to say nothing of ruthlessly dashing the hopes (and expense budgets) of most visitors from abroad.

Many astounding advances in arms and cartridge designs were made in France in the years after the invention there of smokeless powder in 1886. Nevertheless, in small arms developments such as the remarkably modern pre-1900 cartridge and secret, turn-of-the-century "First Wave" autoloader and machine rifle programmes described in detail in this book, everyone associated was rigidly enjoined to remain closemouthed. No patents were sought, so as not to arouse any undue interest outside the tightly-knit French defence research community. This policy of silence has worked only too well, in that it has cheated the French out of a lot more credit than anyone thought they were due .

Of the many marvels and literal "world firsts" revealed herein, two hitherto universally misaccredited mainstays of modern-day assault rifles stand out:

Many (including this editor) have long puzzled over the thorny issue of just who first did away with pins and linkages and invented the carrier-controlled, rear-locking, tilting bolt. Was it the Belgian, Dieudonné Saive, in his 1936 origination of what became the FN 49 and later the famous FN FAL? Or was it the Russian, F V Tokarev, in the autoloading rifle of 1938 that bears his name?

Turns out it was the French. In 1926.

Then there is the simplest gas system ever developed, literally the gas system: a plain tube with no moving parts, which channels the gas impulse itself from the gas port directly into the bolt carrier. Today the gas system is typefied in the M16A2 (and follow-on) rifles, but it is popularly thought to have been first embodied in the Swedish semi-automatic Ljungmann AG m/42b. Not so. The origins of the gas system appear to have been purely French, invented by a certain Monsieur Rossignol in 1900, and used from 1922 onward throughout the entire period of development of French autoloading rifles discussed herein.

Jean Huon has finally set the record straight about the importance of French contributions to modern arms design. This is an important, epoch-making book for arms researchers and military historians of all nations, to say nothing of the arms collecting fraternity worldwide. What can one say, except, *Salud*, Monsieur Huon!

R Blake Stevens
Gore's Landing, Ontario, Canada
November 11, 1994

1. Map of France, showing the locations of the important State-owned armsmaking and testing facilities discussed in the text of this book. drawing by the author

Introduction

Truly *Vénérable*: the French State Arsenal System

Manufacture Nationale d'Armes de St-Etienne

2. A popular French postcard of a bygone day shows workers leaving the *Manufacture Nationale d'Armes de St-Etienne* (MAS) plant at quitting time through the ceremonial "Gates of Honour". Firearms have been produced in the St-Etienne region since the fifteenth century. Author's collection

Through the centuries the production of small arms, artillery and other military supplies for French forces has been confined to certain manufacturers whereof the number, and the location, has often been subject to change.

The earliest of these is St-Etienne, situated between Lyon and Clermont-Ferrand, in the heart of a region rich in iron ore, coal, stone quarries, and pure water. The St-Etienne area has for centuries supported many forges and ironworks. In the fifteenth century certain of these, having long specialised in the manufacture of spears, pikes and other bladed weapons, found it a natural progression to develop firearms.

St-Etienne has been producing artillery since 1472, although it was Francis I who first officially adopted St-Etienne weaponry to equip his army, conferring on a certain Georges Virgile in 1535 the responsibility of organising the local 'cottage industry' to serve as his own personal organ of mass production as the *Manufacture Royale d'arquebuses à rouet* (wheel lock).

In 1669 St-Etienne numbered some 28,000 citizens, 650 of whom were registered artisan-armourers

specialising in the manufacure of hunting and military arms, in particular "for Royal and foreign armies". Also in that year Louis XIV founded the Royal Arms Warehouse of Paris (*Magasin Royal des Armes de Paris*), designed to provision and oversee St-Etienne and the other provincial arsenals.

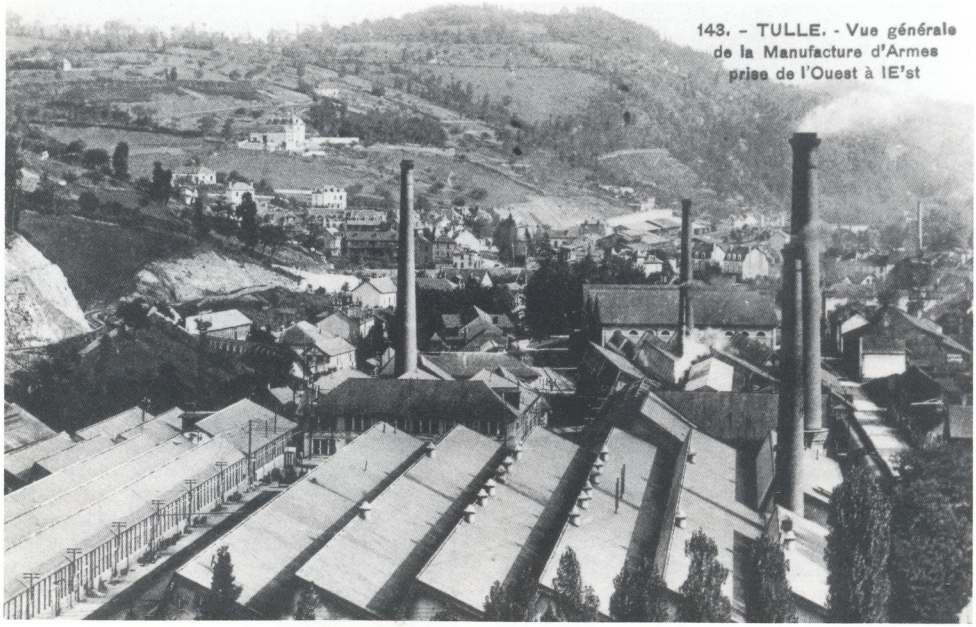
In 1765 St-Etienne produced 20,000 rifles: by 1777 uniformity of production had been established at St-Etienne, Maubeuge and Charleville Arsenals, and, as production returned to normal after the French Revolution, the French arsenal system produced 1,000,000 rifles between 1806 and 1815 (even allowing for an Austrian occupation of St-Etienne in1814!)

The last two French flintlock musket models were produced at St-Etienne, after the Restoration, in 1816 and 1822 respectively.

Other Important Arsenals

Imperial arsenals for the manufacture of firearms and bladed weapons were established at Charleville (1695), Kligenthal (1730), Maubeuge (1701), Mutzig (1802), St-Etienne, and Tulle. Due to its proximity to an area rich in high-quality iron ore, Tulle, a small city in the heart of France, has long held a reputation for fine locksmithing. Again a natural progression took place when the wheel lock *arquebuse* was introduced in the sixteenth century. The first recorded *canonier* of Tulle was Jehan Bourget (1642).

As can be seen from the map in fig 1, many of these proximitous arsenals were located close to France's northern and eastern borders, and were, over the centuries, frequently attacked and often destroyed. This situation was improved, beginning with the creation of a new arsenal at Châtellerault in 1819. Châtellerault, with a geographical location which protected it against the natural invasion routes through the area, had long been a production centre for edged weapons and cutlery. Progressive closures of Charleville, Kligenthal and Maubeuge starting in about 1830 were capped with the



3. Another postcard, showing a general view over the eastern hills of *Manufacture Nationale d'Armes de Tulle* (MAT).
Author's collection

4. A third postcard, showing workers leaving the factory of *Manufacture Nationale d'Armes de Châtellerault* (MAC).
Author's collection

closure of Mutzig in 1869, after which there remained only the "big three": St-Etienne, Châtellerault, and Tulle.

From Imperial to State—Abruptly

The status of MAS, MAC and MAT as Imperial arsenals ended abruptly with the surrender of Emperor Louis-Napoleon to Prussian forces at Sedan on September 4, 1870. All three French arsenals later became *Régies d'Etat* (Regimes of the State; State-run).

While not necessarily the leader, MAS has historically been the most important French factory for the mass production of small arms.

Deadly Rivals in an Era of Swift Change

A deep and long-lasting thirst for *revanche* suffused all of France following the ignominious defeat of the French Army, the finest in Europe for the previous seventy years, at the hands of the Prussians and Germans in the Franco-Prussian War of 1870 - 1871.

As for the victors, Bismarck refused to soften the peace terms which ended that war, countering that Germany had been invaded thirty times by the French in two centuries—fourteen times in the 20 years from 1785 to 1813 alone.

As a result of these deep and mutually-held animosities a state of rivalry existed between France and Germany at the dawn of the metallic cartridge era, and important amounts of money were made available to the armies of both countries for weapons development. The advantage of small arms superiority was sought by any means available, including out-and-out copying.

Introduction of the Metallic Cartridge

In 1871 the German Rifle Testing Commission, stationed at Spandau Arsenal, recommended the adoption of the "Infantry Rifle M/71", a single-shot, bolt-action Mauser rifle which fired a rimmed, black powder metallic 11x60mm cartridge like that of the Austrian Werndl. Firing a 25g (386 gr) lead bullet, the 1871

Mauser copied some features from the breech design of the French Chassepot, generally regarded as the finest pre-metallic cartridge breechloader.

Not to be outdone, three years later the French adopted a centre-fire, 11x59R rimmed metallic cartridge of their own, and a new rifle which bore the name of its designer, Captain Gras. M1874 Gras rifles were manufactured at the State arsenals of Châtellerault, St-Etienne, and Tulle, and the new Gras bolt was also adapted to the Chassepot rifles and carbines already in service, so that in time most of these were converted to fire the Gras metallic cartridge. The 11x59R Gras round featured a rimmed brass case, slightly bottle-necked at the throat, loaded with a 25g (386-gr) semi-ogival lead bullet atop 5.25g (81 gr) of black powder.

Use of the 11mm Gras cartridge was continued in the bolt-action M1878 and M1884 Kropatschek repeaters, and in the M1885 rifle. Indeed, as discussed in the Collector Grade book *The Grand Old Lady of No Man's Land*, the 11mm Gras round, loaded with armour-piercing and incendiary bullets, saw considerable service in World War I aircraft and anti-aircraft machineguns, both guns and ammunition being manufactured in France and in the USA.

The First French Repeaters

The Austrian Kropatschek was the first tube-magazine rifle used in France. As made by Steyr, the Kropatschek was first adopted in 1878 in calibre 11mm Gras by the French Navy for its Marine Infantry.

In 1883 this early tube-loader became the basis for study by the newly-formed *Commission des Armes à Répétition* (Repeating Rifle Commission). The "Gras-Kropatschek" was first manufactured in France in 1884.

In that same year the Germans adopted an improved version of the single-shot M/71 called the M71/84, which was fitted with an 8-shot tubular magazine under the barrel.

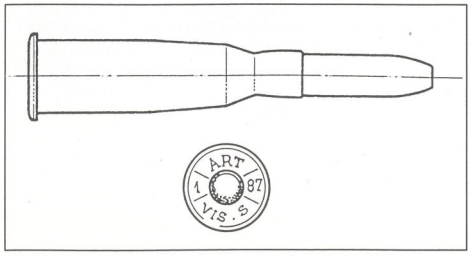
The following year the French countered with the M1885, later described as "the intermediary between the Kropatschek and the Lebel". Derived from the M1878 Kropatschek and the M1884 repeater, the 11mm M1885 featured a two-piece stock, a stronger bolt, and a tubular magazine encased in the forestock under the barrel. The M1885 is a scarce gun today: only 21,000 were manufactured at Châtellerault and 17,883 at St-Etienne, in calibre 11x59R Gras.

Revolutionising Riflery: the Invention of Smokeless Powder

At this time of burgeoning development in the field of military small arms, virtually all the world's major armies had adopted black-powder cartridges firing lead bullets of around 11mm (.45 calibre). Then, the theories of the Swiss Major Rubin, who advocated reduced-diameter bullets, gained credence.

In France, various experiments were begun in 1880 in 8, 9, and 10mm calibres. It was soon discovered that when firing the 8mm version of the Gras case loaded with black powder (called the "Petit Gras"), the exterior of a solid-lead bullet would overheat and actually start to melt in the bore, thus deforming the bullet and filling the rifling grooves with lead. The solution was found in the early 1880s design by the mentioned Major Rubin of the Swiss Army, wherein a lead core was clad in a ductile envelope or "jacket" of gilding metal.

Then came the development which revolutionised riflery. After much trial and error, Paul Vieille, a chemist and engineer at the French government *Laboratoire Central des Poudres et Salpêtres* (Central Powder Laboratory) perfected in 1884 a method of processing nitrocellulose (nitrated wood pulp) which, after further chemical additions was thinly rolled, dried and flaked to become the world's first progressive-burning, smokeless gunpowder. This new *Poudre* 'V' (named for the inventor, Paul Vieille, and later renamed *Poudre* 'B') offered revolutionary ballistic advantages compared to black powder, with the former producing vastly increased propulsive energy while using a fraction of "product", with neither the clouds of acrid smoke nor the troublesome fouling of the latter.

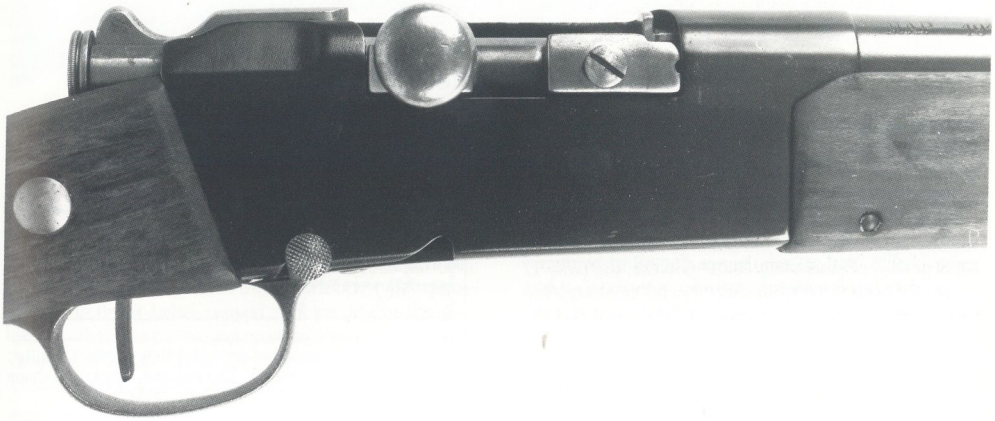


The World's First Smokeless Rifle: the 8x50R *Modèle* 1886 (Lebel)

5. The 8mm *Modèle* 1886 Lebel cartridge, loaded with the flat-tipped *balle* 'M' bullet.
Below: headstamp showing manufacture in 1887.
Actual-size drawing by J Barlerin

6. The *Modèle* 1886 "Lebel" rifle, the world's first rifle specifically designed to fire a small calibre, smokeless cartridge. The Lebel was an accurate, proven shooter, firing a cartridge ballistically superior to all others of its day.

Although soon obsoleted by quicker loading systems, the Lebel remained in production throughout World War I.



7. The tubular magazine under the barrel of the Lebel could only be loaded through the open breech, which slowed down its practical rate of fire considerably.

The Lebel was subjected to a series of modifications during its long history, and original M1886 rifles are today extremely rare. Note the breech shield (above the bolt head), introduced in 1893. This rifle is actually a *Modèle* 1886-M93.

The French Minister of War in 1886, General Boulanger, was a prominent figure of great political power. As soon as he was made aware of Vieille's discovery, General Boulanger decided that France would quickly issue a modern weapon to capitalise on the vastly improved ballistics offered by the new smokeless powder. In January, 1886 he therefore rashly decreed that a small-bore rifle, and cartridge, be designed and ready in three months.

With the discovery of smokeless powder the Repeating Rifle Commission, presided over by General Tramond, had been downsized to comprise scientist Paul Vieille and Colonels Lebel, Gras, Desaleux, Bonnet and De Tristan. In 1885, the Gras rifle was modified by the Commission to 8mm: the Gras case was redesigned by Gras and Desaleux; the bullet was designed by Colonel Lebel and General Tramond after the Swiss Rubin design; and a new bolt with two symmetrical front-locking lugs (a novelty in 1885!) was designed by Colonel Bonnet. Overall control of the design was left to Colonel Gras, working closely with *Contrôleur* Close of the State arsenal at Châtellerault (MAC).

The new 8mm bullet was named the *balle* 'M' for its gilding jacket, a cupro-nickel alloy known as "maillechort" after the two metallurgists (named Maillot and Chorier) who had perfected it.

Due to General Boulanger's unrealistic 3-month deadline the finished cartridge presented a rather ungainly silhouette, with the wide rim of the 11mm Gras round giving way to a doubly-truncated case (dictated by the tubular feeding system of the Model 1886 rifle, which featured a trough-like "transporter"). The 8x50R cartridge was loaded with 2.3g (35.5 grains) of BF (smokeless) powder, which propelled the flat-tipped *balle* 'M' to a muzzle velocity of 630 m/s (2,067 fps).

Rebarreled and equipped with Colonel Bonnet's new twin-lugged bolt (to better handle the increased pressures of the 8mm round), the new rifle was officially adopted on April 22, 1887 as the *Fusil Modèle* 1886. With 8 rounds in the magazine tube plus one in the

trough of the transporter and one in the chamber, the M1886 rifle, fully loaded, held 10 rounds.

Although Colonel Lebel always protested that Colonel Gras had had far more to do with the overall design than he, the M1886 became known as the Lebel rifle. The M1886 Lebel was the first military rifle in the world designed specifically to use smokeless powder.

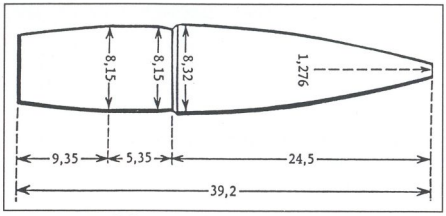
Manufacture was entrusted to all three State arsenals: Châtellerault, St-Etienne and Tulle. For this purpose the three plants received many ultra-modern machines, purchased partly in the United States.

Under this very determined programme the three French State arsenals worked at full speed eleven to twelve hours a day, six and a half days every week. In six years, they mass-produced over three million M1886 rifles.

The performance of the Lebel rifle seemed to justify this effort, for the ballistics of the 8mm Lebel round were better than those of any other cartridge in the world at that time. In muzzle velocity, accuracy, and flatness of trajectory, the 8mm Lebel round was to reign supreme for several years. Manufacture of the M1886 rifle, slightly modified from time to time, continued throughout World War I. Modifications of existing rifles continued into the thirties.

The Solid-Brass, Boattailed *Balle 'D'* (1898)

In 1898 research into the shape of artillery projectiles led to the further improvement of the 8x50R's ballistics by the adoption of the bi-ogival (pointed and boattailed) *balle* 'D' bullet, the creation of Lieutenant-Colonel (later General) Desaleux. Made of solid brass, the *balle* 'D' was slightly lighter than the old *balle* 'M'. Loaded with 3g (46.3 grains) of smokeless BN3F powder, the *balle* 'D' improved both the muzzle velocity and mid-range trajectory of the 8mm Lebel round to the point that the sights on the rifles had to be recalibrated.



8. Dimensioned drawing of the solid brass *balle* 'D' bullet, designed by Lt Col Desaleux. The pointed, boattailed shape of this bullet gave it excellent ballistic properties.

Characteristics of the 8x50R

	Balle 'M'	Balle 'D'
bullet construction	lead core, cupronickel jacket	solid brass
bullet weight	15g (231 gr)	12.8g (197.5 gr)
muzzle velocity	630m/s (2,067 fps)	700m/s (2,297 fps)
mid-range trajectory at 600m	2.41m (7.9')	1.43m (4.7')
maximum range	3,200m (3,500 yd)	4,400m (4,812 yd)

The Legacy of Haste

As noted, France was in 1886 the first country in the world to adopt a repeating rifle and a small calibre cartridge using smokeless powder, thus gaining a considerable technical advantage over other countries, particularly her hated neighbour Germany. While these developments held important consequences for the future of small arms in general, unfortunately for France this initial advantage was soon overshadowed and surpassed by developments elsewhere.

Even as the State arsenals were midway through the Lebel mass production programme, the tubular magazine was obsoleted by the introduction of Mauser and Mannlicher packet loading systems, which offered much faster reloading. As early as 1890 the French began augmenting the Lebel with Mannlicher-Berthier repeating rifles designed by Monsieur A Berthier, an engineer with the Algerian railroad, which combined the Lebel bolt with the *en bloc* Mannlicher clip-loading system.

Furthermore, in spite of the excellent ballistics of the 8x50R cartridge, its shape was not at all well adapted to feeding, except in bolt-action rifles and in automatic

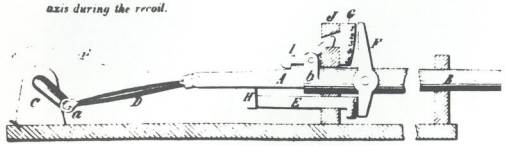
9. France adopted the Mannlicher-Berthier carbine for her cavalry in 1890. This 8mm Lebel calibre short rifle was loaded with an *en bloc* packet of three cartridges.

weapons, such as the Hotchkiss, which used a rigid feed strip. In autoloading arms fitted with box-type magazines the 8mm Lebel proved problematic in the extreme—this was the reason more modern rounds were developed for the "First Wave" autoloading rifles discussed below. Nevertheless, the 8mm Lebel cartridge remained in French service during both World Wars, and its fabrication was not phased out until the 1950s. Numerous variations were made: tracer, armour-piercing, incendiary, grenade blank, parade blank, reduced range, etc.

10. Dragoons at *Camp de la Courtine* firing from the kneeling position during exercises with their new M1890 Mannlicher-Berthier carbines. When empty, the 3-shot *en bloc* clip fell out through a slot in the bottom of the magazine.

A

Recoiling barrel and breech-block, the latter carrying a lever **F** *which on recoil collides with a stationary resistance* **G** *and drives the rod* **E** *and breech-block backward. The crank is thereby turned from point* **a** *to* **a¹** *through the interrention of a connecting rod* **D**, *the lever* **L** *that locks the breech-block to the barrel being disengaged by turning about its axis during the recoil.*

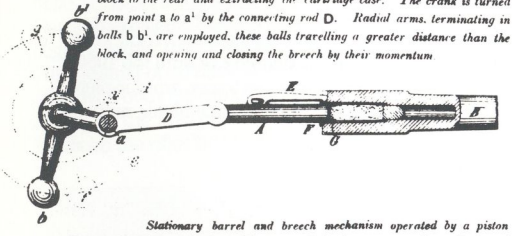


B

Stationary barrel and rimless cartridge completely surrounded by the barrel. The cartridge, being short, is thrown backward on explosion, thereby opening the breech by driving the breech-block to the rear and turning the crank from point **a** *to* **a¹** *through the connecting rod* **D**.

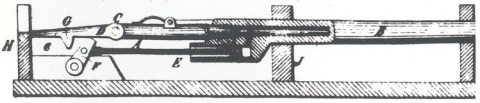
C

Stationary barrel and long cartridge, having a movable base or piston which is driven backward on explosion, thereby forcing the breech-block to the rear and extracting the cartridge case. The crank is turned from point **a** *to* **a¹** *by the connecting rod* **D**. *Radial arms, terminating in balls* **b** **b¹**, *are employed, these balls travelling a greater distance than the block, and opening and closing the breech by their momentum.*



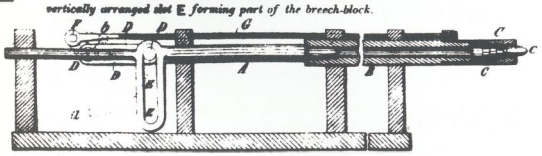
D

Stationary barrel and breech mechanism operated by a piston working in a cylinder. The gases of discharge escape from the barrel into the cylinder, thereby forcing back the piston and opening the breech by the action of a lever which is connected to the piston rod, and whose nose strikes against a projection **G** *on a lever* **D** *pivoted to the breech-block.*



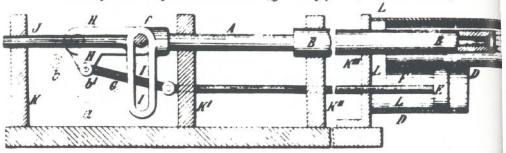
E

Stationary barrel, with a cylinder or nose piece **C** *at the muzzle, which is forced forward on discharge, whereby a rod* **G** *connected to the crank* **D** *is operated, and the breech opened by the crank pin working in a vertically arranged slot* **E** *forming part of the breech-block.*



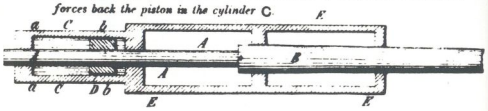
F

Stationary barrel surrounded by a casing **C** *which communicates with a cylinder* **D**. *This cylinder contains a piston* **E**, *to which a backward movement is imparted by a partial vacuum created behind it when the gases of discharge escape from the muzzle. The movement of the piston is transmitted by rods to a crank which opens the breech by the crank pin working in a vertical slot* **L** *forming part of the breech-block.*



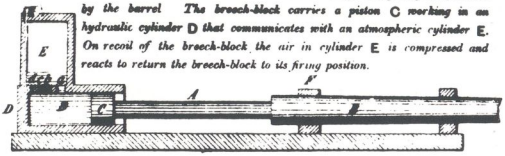
C

Stationary barrel and rimless cartridge completely surrounded by the barrel. The breech-block is kept closed by an hydraulic piston **D**, *forming part of the breech-block. On discharge of the gun the breech-block forces back the piston in the cylinder* **C**.



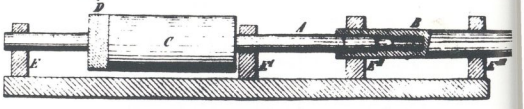
H

Stationary barrel and rimless cartridge completely surrounded by the barrel. The breech-block carries a piston **C** *working in an hydraulic cylinder* **D** *that communicates with an atmospheric cylinder* **E**. *On recoil of the breech-block the air in cylinder* **E** *is compressed and reacts to return the breech-block to its firing position.*



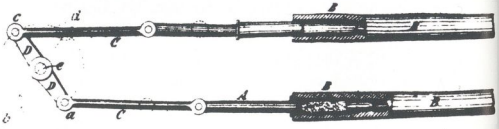
I

Stationary barrel and rimless cartridge completely surrounded by the barrel. The too rapid recoil of the breech block is opposed by the inertia of a weight **C** *having a buffer at its rear to take up the shock of discharge.*



J

Duplex arrangement of barrels in which cartridges with movable bases or pistons are employed. The recoil of one breech-block carries the other forward into firing position by the action of an oscillating arm **D** *whose ends are connected to the breech-blocks by rods* **C**.



11. A set of drawings, produced by Hiram Maxim in 1884 and sent to his patent agents abroad so that they might "classify the various inventions forming the subject of Patents applied for [by Maxim himself] at that time".

courtesy Dolf L Goldsmith

Chapter One

Secret "First Wave" Autoloaders

Definitions

Before 1952 in France, the term *fusil automatique* (automatic rifle) was used to designate a firearm which would reload automatically after each shot, leaving the rifle ready for firing at the next pull of the trigger. This differs from nomenclature used today because the French then used another term, not now common, to designate a *fully* automatic rifle: *fusil mitrailleur* (FM), or "machine rifle".

Because of the adoption of weapons capable of burst fire during World War II, and particularly because of the postwar introduction of lightweight assault rifles, it was important to establish a further distinction. In February, 1952, the General Staff of the French Army established that henceforth a rifle which reloaded automatically would be called a "semi-automatic rifle", while the designation "automatic rifle" was reserved for rifles where firing was continuous as long as the trigger was held back and cartridges remained in the magazine.

In this book we will use the commonly accepted term "autoloading rifle" to denote a firearm which reloads automatically but fires only one shot for each pull of the trigger.

Early Automatic Weapons

The first-ever *self-activating* firearm was invented in 1883 by the expatriate American, Hiram Stevens Maxim, in England. The rifle was recoil operated and was, in fact, a modification of an 1873 lever action Winchester.

By the following year this shrewd and prolific inventor had theoretically "cornered the market" on automatic weapon development by securing very broad patents. For example, in his second patent, No 3493 of July 16, 1883, Maxim claimed protection on *any* arm "constructed substantially so that the explosion of one cartridge will . . prepare the arm for the next discharge".

In his third patent, No 606 of January 3, 1884, Maxim sewed up over a half-dozen method of gas operation, claiming *any* firearm wherein the "dynamic force of the gases escaping from the muzzle is so utilised (either directly or indirectly) that the various operations necessary in working the gun are continued automatically . ."

Among a great many other things, Maxim also patented the method of manufacturing a suitable filament to make incandescent electric light a reality, *and* invented the world's first aeroplane. Knighted by Queen Victoria for his services to the British Empire and world famous through the machinegun which carries his name, Maxim is the subject of the 384-page Collector Grade book *The Devil's Paintbrush—Sir Hiram Maxim's Gun*.

First French Patents

Despite Maxim's intended patent stranglehold on automatic arms design, the idea itself refused to be patented. On September 8, 1888 two French mechanics from St-Etienne, the Clair brothers, requested a patent. The French patent register No 192,828 deals with "a system which, when applied to repeating rifles, makes them function automatically". To achieve this, the Clair brothers used the gas pressure which developed in the barrel upon firing a cartridge, bled off a portion of that gas into a cylinder and used a piston, parallel to the barrel, to work the bolt (altogether a remarkably similar concept to one of the several espoused by Maxim in his

mentioned British patent No 606 of four years earlier). Nevertheless the French patent was granted, the inventors foreseeing the manufacture of a rifle and the application of their system to all kinds of firearms, from machineguns to artillery pieces. Additions to this French patent were filed on January 10, 1889, December 5, 1891 and March 22, 1892.

The Clair brothers manufactured several weapons based on their gas impingement patent, including a shotgun, and an automatic pistol which was presented at Châlons Camp on June 15, 1898. An interesting autoloading carbine (discussed later in this chapter) was presented on July 5 of that same year.

A Worldwide Trend to Autoloading Rifles

During the 1890s and the early years of the twentieth century, numerous other inventors came up with automatic rifle designs which functioned by various gas or barrel recoil systems. Although some of their names have faded almost completely, others are still remembered today as pioneers whose inventions have withstood the test of time: von Mannlicher (Austria); Browning (USA and at FN, Belgium); Mauser (Germany); Cei-Rigotti (Italy); Quist (Norway); Madsen-Rasmussen (Denmark); Griffin & Woodgate (England); Friberg-Kjellman (Sweden); Mondragon (Mexico/Switzerland); Bang (Denmark); Revelli (Italy) . . the list goes on.

Most of these arms were evaluated in France, where experiments continued until the eve of World War I. During that confict the French were the first in the world to issue autoloading rifles to troops at the front.

12. A French *Zouave* around the turn of the century, armed with the obsolete, tube-loading 8mm Modèle 1886-93 Lebel rifle, of which millions of examples were made.
Author's collection

The Browning Long-Recoil System

In 1900 the prolific John M Browning applied for a US patent on an autoloading rifle of his invention, wherein the barrel and breech, locked together, recoiled within the frame of the gun until pressures had dropped to a safe level, whereupon the barrel returned and the breech block, after ejecting the empty case in its extractor, moved forward again to pick up and chamber the next round in the magazine. US patent No 659,786 was granted to this design on October 16, 1900.

The world's first commercially successful high-powered autoloading rifle, the Remington Model 8, was produced under license using the Browning long-recoil system. Introduced in 1906, the Model 8 was offered in several rimless calibres from .25 to .35 Remington. In 1936 it was superseded by a variation, the Model 81, which was not dropped from the line until 1950. The same gun was made from 1910 to 1931 as the .35 cal FN Browning Rifle by Browning's European partners *Fabrique Nationale d'Armes de Guerre* of Herstal, Belgium.

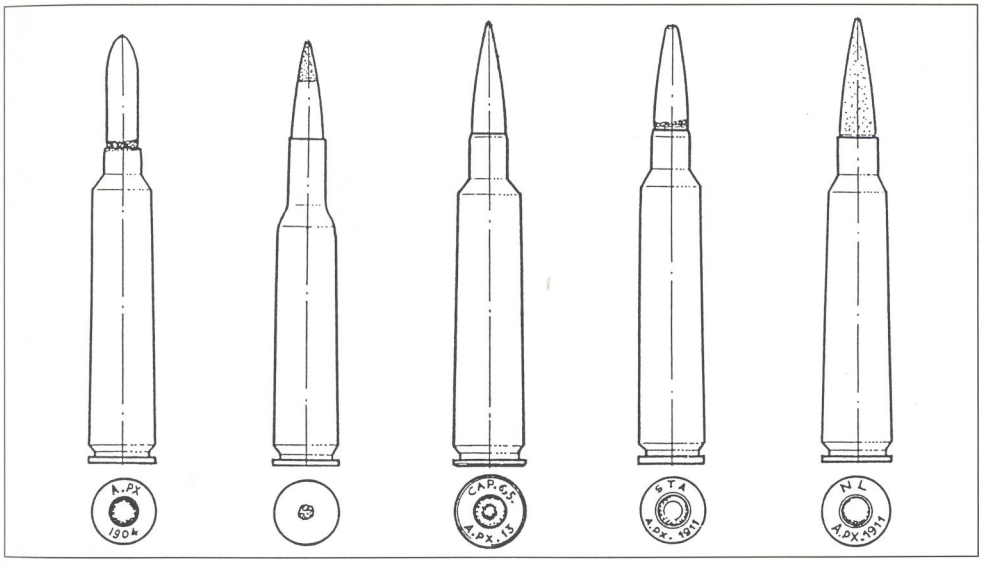
Even though Browning took pains to patent his long recoil action in France as well as other countries, it so happened that the French designer Chauchat,

among others (and also the Hungarian, Frommer) seized upon this very design as offering a number of advantages. As discussed below, several virtually direct copies of the Browning long recoil action were produced during France's secret "First Wave" autoloading rifle programme.

A Daring Game of Leapfrog

By the turn of the century, the Germans had introduced the superb Model 98 Mauser rifle—more than a match for the slow, tube-loading 8mm Lebel. The French General Staff recognised that the Lebel and indeed the 8x50R cartridge were obsolete. In addition to augmenting their slow, tube-loading Lebels with Mannlicher-Berthier bolt rifles, they devised a secret, long-term plan whereby France could once again wrest superiority from her old enemy by perfecting and adopting an *autoloading* military rifle, and a new rimless cartridge.

Cartridges Ahead of their Time



13. Some of the remarkable experimental smokeless French cartridges produced for the "First Wave" of autoloading rifle trials. These astoundingly modern, micro-bullet designs produced excellent ballistics, but were far in advance of their time. From left:

- 6x58 STA, as used in the original Meunier A1 rifle and A1 carbine of 1903. This cylindro-ogival bullet, lead core with cupro-nickel jacket produced a muzzle velocity of 800m/s (2,625 fps).
- 6x60 ENT, as used in the Rossignol direct-gas machine rifle. The bi-ogival, iron-cored, tombac-jacketed bullet weighs 5g (77 gr). Note the very small primer.
- 6.5x60 CAP (*Commission des Armes Portatives*; Small Arms Commission. Used in the ENT B1 rifle.
- 6.5x61 STA, as used in the A5 rifle. Bi-ogival, steel-cored bullet with partial or full tombac jacket.
- 7x59 STA, designed by Louis Chauchat and used in several long recoil "*Système* CS" prototype autoloading rifles and machine rifles designed by Chauchat and his assistant Sutter. Produced with several types of bullets—solid bronze, steel core with tombac jacket, or mild steel jacket, nickel-plated.

actual-size drawings by J Barlerin

Towards the end of nineteenth century, studies were begun to develop a new military small arms round in a small calibre. Several remarkably modern-looking cartridges were developed between 1894 and 1900, mainly in 6mm, 6.5mm and 7mm calibres, with many variations in case length and bullet design, and tested in experiments wherein various manually-operated repeating rifle prototypes were also evaluated. However, by 1900 the emphasis was on the development of autoloading rifles.

Pre-WWI French Research Centres

Several French military establishments were involved in small arms research at this time. Known by the acronyms formed from their French names (which themselves were changed from time to time), these agencies were as follows:

- APX: *Etablissement Technique de l'Artillerie à Puteaux* (Puteaux Arsenal). Created in 1866 as *L'Atelier de Fabrication de Puteaux* to supply machine tooling for the manufacture of the Chassepot, then a leading centre of artillery development for many years. The famous "French 75" artillery piece was developed here, from 1892 to 1897. Home of Messrs Chauchat (from 1903) and Sutter (from 1904), who designed the *"système* CS" machine rifle (later evolved into the CSRG Mle 1915). Under the auspices of General Naquet-Laroque, Chauchat and Sutter also produced various prototype long-recoil autoloading rifles at APX between 1903 and 1909.
- CAP: *La Commission Centrale des Armes Portatives* (Small Arms Committee), a subsidiary of the Artillery Committee. Formed in 1897-98 to replace the *Commission des Armes à Répétition*, which had ceased to have a function after the adoption of the *Modèle* 1886 Lebel repeater.
- CTV: *Commission de Tir de Versailles* (Versailles Trials Commission). Originated at Satory, near Versailles, and known by various names. The original *Commission de Tir de Versailles* (CTV) became the *Commission Technique d'Expérience de Versailles* (CEV), then *l'Establissement Technique de Versailles* (ETVS). Chauchat was also a member of the CTV, and there designed several autoloading prototypes as well as participating in ongoing comparative trials.
- ENT: *Ecole Normale de Tir* (Army Musketry School). A centre for trials of small arms and artillery, located at Châlons Camp, Châlons-sur-Marne. Developed numerous autoloading prototype rifle designs, starting in 1901.
- STA: *Section Technique de l'Artillerie* (Artillery Technical Section). The central technical depot for the development of arms, artillery and munitions, reporting to the Artillery Committee. Developed six prototype rifles and several 6, 6.5, 7 and 8mm cartridges between 1894 and 1913.

Starting in 1894, working alone or in collaboration, these agencies were engaged in the development of cartridges and autoloading rifles under the most secret conditions. Research was done in a most confidential way, and no patents were sought so as not to awaken any curiosity. Most of the research ammunition for the autoloading rifle programme was made at the factory of the State-owned Puteaux Arsenal.

The experimental cartridges and prototype rifles were subject to experimentation as soon as they were proofed and tuned. The best of these were then shot and examined in comparison with one another in official trials.

First French Prototypes

More than twenty different automatic and autoloading rifle prototypes were produced by the French experimental establishments during the period 1894 - 1913. The information here, sketchy as it is, is the most detailed ever to be printed on the subject of the secret "First Wave" of French autoloaders. The exigencies of two World Wars have scattered and destroyed much of the early documentation, and photographs of many prototypes are not available. As discussed in Chapter Six, the MAS plant was ransacked by the *Maquis* after St-Etienne was liberated in September, 1944, and every available weapon was appropriated to aid in harassing the retreating Germans, including many priceless prototypes.

Rifles of the Artillery Technical Section (STA)

Rifle A1: the First French Military Autoloader

Etienne Meunier, administration official and weapons inspector at the Puteaux Artillery Plant (APX), was one of the automatic rifle pioneers in France. He had worked since 1894 with the technician Pralon on a model which functioned by gas. By 1900, Pralon himself was Chief of Small Arms Development at STA.

This rifle, originally known as the STA No 4 (later the A1), was perfected in 1897 and officially presented

14. Right side view of the autoloading Rifle STA No 4 (Rifle A1). Perfected in 1897 by Pralon and Meunier, this gas impingement design was the first French military autoloading rifle ever produced.

The STA No 4 shares some similarities with the Mondragon, which was not patented until several years later.

in 1898. The STA No 4 was the first French military autoloading rifle ever produced.

The STA No 4 (A1) was a gas impingement design, with a piston under the barrel. The bolt head, with three series of five interrupted-thread locking lugs, rotated in a helix to unlock the bolt. The Mauser-type magazine held eight cartridges in staggered form. The special 6mm cartridges, loaded with 2.80g (43.2gr) of BN3F powder, were produced at the Puteaux cartridge factory.

Characteristics of the Meunier A1

action	gas impingement
calibre	6x58mm
bullet weight	6.7g (103 gr)
muzzle velocity	900m/s (2,953 fps)
total length	1.27m (50")
weight	3.830kg (8.44 lbs)
magazine capacity	8 rounds

Rifle A2

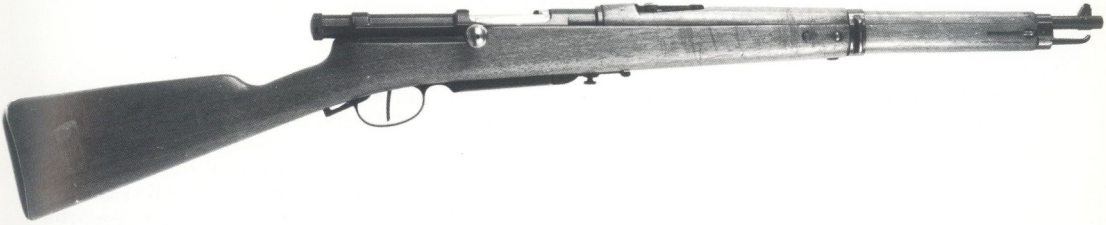
Originally the STA No 5, this was a variation of the preceding model, manufactured in 1899 for an 8mm cartridge.

Rifle A3

Originally the STA No 6,the A3 was a further evolution of the A2, made in 1900 in calibre 8mm.

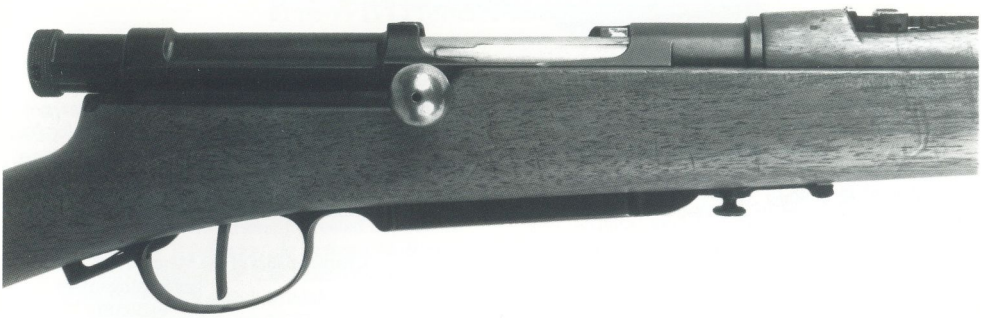
Carbine A4

Originally the Carbine, STA No 1, this was one of the best known weapons of its time. Its design was very close to that of the Pralon & Meunier A1 Rifle, except the length was reduced to 1.27m (40"). Both the A1 rifle



15. Right (above) and left (below) views of the Carbine STA No 1, later designated the Carbine A4. Manufactured in limited numbers for troop trials in 1903, this shortened version of the 6x58mm Meunier A1 rifle was enthusiastically received by cavalry units.

Note the "grip safety", which must be squeezed before the action will fire at the pull of the trigger.



16. Right side closeup of the 6x58mm Meunier A4 Carbine (Carbine STA No 1) of 1903. The "grip safety" can clearly be seen.

and A4 carbine shot the same 6x58mm cartridge, although the carbine held only 5 rounds. Intended for mounted use, the carbine had a 'grip safety' fitted behind and below the trigger guard.

The A4 Carbine was manufactured in small quantities and was tested by several different bodies of troops in 1903: the 9th Regiment of *Cuirassiers* at Noyon; the 24th Dragoon Regiment at Dinan; the 2nd Regiment of Light Cavalry at Pontivy, and the 7th, 13th, and 14th Regiments of Hussars. Test results, presented on May 24, 1903 were very favourable, with the Trials Commission concluding on May 24, 1903 that the A4 Carbine was suitable for adoption. Despite its popularity, the STA No 1 (A4) carbine was abandoned by the Rifle Testing Commission.

Rifle A5

17. Rifle A5 (STA No 7), calibre 6.5x61mm. The tangent rear sight of this 1908 Meunier gas impingement design is calibrated from 300 to 2,400 metres.

In 1908 Meunier presented a new rifle, originally called the STA No 7. The A5 is a modification of the A1 rifle wherein, while keeping the bolt design of the STA No 4 carbine, the cocking handle was inspired by that of the Swiss Model 1896-99 Schmidt-Rubin straight-pull bolt rifle, and the gas cylinder was located on the right side of the barrel instead of on top as before. It will take a bayonet. The magazine holds six cartridges.

It is chambered for a 6.5x61mm cartridge loaded with a 3.45 to 3.5g (53 to 54 gr) powder charge and a light, pointed bullet weighing only 6.75g (104 gr), which produced (for its day) the amazingly high velocity at 25m of 992 to 1,018 m/s (3,255 to 3,340 fps)[1].

1 As on the ENT rifle of the same calibre, the STA rifle in 6.5mm had four-groove rifling with a twist of 1 turn in 150mm (5.9").

18. Right side closeup of the A5 Meunier rifle. Note the gas piston, repositioned in this model to the right side, and the cocking handle button, which resembles that of the straight-pull Swiss Schmidt-Rubin.

Rifles of the Musketry School (ENT)

The Origins of the *Gas* System: the Rossignol Rifle

19. Right side view of the 6mm B1 rifle, perfected in 1901. The Rossignol rifle was the originator of the direct, pistonless gas system.

An ENT repeating test rifle, perfected by weapons inspector Rossignol in 1896, had a straight-pull bolt operated by a reciprocating lever mounted on the grip. The bolt in the Rossignol design was locked by the Friberg-Kjellman system of two laterally opposed retractable lugs (as in the later FN autoloading infantry rifle of 1914, the still later German G43, and the even later EM-2).

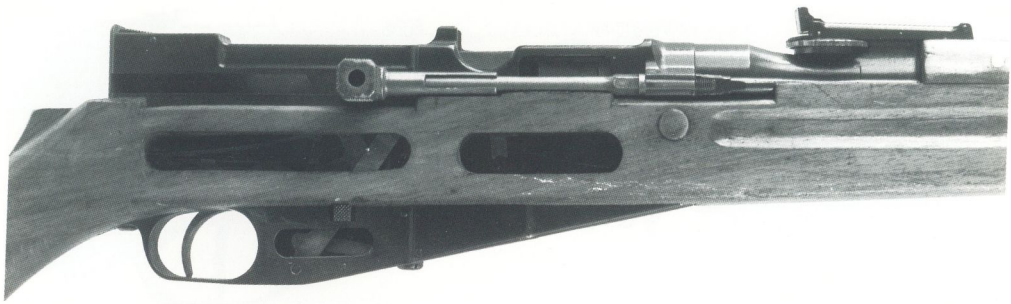
As the locking system worked well, Rossignol replaced the crank-type bolt handle with the world's first *pistonless* gas system, wherein a simple gas tube or *adducteur* placed laterally (initially on the right side of the barrel) carried the gas to the rear, where it impinged directly on the bolt carrier[2].

The Rossignol direct gas system was presented in a machine rifle, discussed below, and in the 6x60mm B1 autoloading rifle of 1901. The B1 rifle used a flat recoil spring, and a Mauser type magazine, loaded by a stripper clip, which held six cartridges.

Characteristics of the Rossignol Rifle

action	direct gas
calibre	6x60mm
total length	1.270m (50")
weight	4.226kg (9.3 lbs)

2 The same system as used years later in the Swedish Ljungmann AG m/42b and US ArmaLite and M16 rifles.



20. Right side closeup of a cutaway Rossignol B1 autoloading rifle. The arm of the flat recoil spring is visible, as is the end of the gas "adductor" housed in the hollow shaft of the bolt handle/operating rod. The right-hand bolt locking lug can also be seen.

Rifle B2

A variant of the previous model, also in 6mm calibre. Its handguard is larger, with a permanently attached sword-bayonet with a "T" type blade and tube handle.

The World's First Weapons System: the ENT B1 (Rossignol) Machine Rifle of 1900

21. The original Rossignol ENT B1 6x60mm FM (machine rifle) of 1900. With the B1 machine rifle and B1 autoloader, the ENT School produced the first real weapons *system* in military history.

The ENT machine rifle was 1.310m (51.2") long and weighed 9.7kg (21.4 lbs). Note the bipod, and folding shoulder rest.

As noted, a machine rifle also known as the B1 in calibre 6x60mm was introduced by weapons inspector Rossignol in 1900. The ENT School thus produced a real weapons *system* for the first time in military history.

The ENT B1 machine rifle was fed by a detachable, vertical box magazine, which could be replenished through the open action by means of stripper clips. Two versions of the ENT machine rifle exist: one with a single gas "adductor" and another with a symmetrically matched pair.

Rifle B3

Originally the ENT No 2, this model functioned by short barrel recoil according to the device developed by a technician named Belgrand. Made in calibre 6.5mm.

Rifle B4

Another rifle using the Rossignol gas *adducteur*, scaled up to calibre 8.5mm.

Rifles of the Versailles Technical Commission (CTV) and Puteaux Arsenal (APX)

The autoloading arms from these two establishments are linked by their common designer, Jacques Louis Henri Chauchat (1863 - 1917) and his later assistant, *Contrôleur d'armes* Sutter. These men first met at the Versailles Commission in 1900, where Chauchat, then 37, was working on recoil-operated autoloading rifle and cartridge designs.

It appears that, other than the Musketry School's original Rossignol machine rifle, Louis Chauchat, working at Versailles and then at Puteaux Arsenal, was the only designer concerned with machine rifles as well as autoloaders.

Rifle C1

Formerly the CTV No 1. Made at Versailles in 1903, it was an 8mm machine rifle, functioning by long barrel recoil.

Rifle C2

Formerly the CTV No 2. A variant of the preceding long-recoil machine rifle, in calibre 6.5 or 7mm.

Rifle C3

Formerly the APX No 3, this autoloading model was designed by Chauchat and Sutter and manufactured in 1904 by the workshops of the Puteaux Arsenal. It functioned by long barrel recoil. The C3 fired a 7mm cartridge, also of Chauchat's design.

Rifle C4

Formerly the APX No 4. Evolution of the long-recoil Chauchat/Sutter autoloading APX No 3 above, in 1905.

Rifle C5

22. The 7x59mm C5 rifle, *Système* CS (Chauchat/Sutter) of 1906. This rifle functions by long recoil of the barrel and locks by means of interrupted-thread-type lugs on the front of the bolt. The cartridge was also designed by Chauchat.

Overall length: 1.3m (52"); weight 7.20kg (15.9 lbs). Magazine capacity: 6 rounds.

23. Right side closeup of the C5 rifle. The magazine, streamlined into the wooden stock, is loaded by means of an *en bloc* clip of six cartridges.

The C5 rifle was perfected at Puteaux Arsenal by Chauchat and Sutter in 1906, under the direction of General Naquet Laroque[3].

The C5 functioned by long barrel recoil. The bolt locks by means of interrupted threads on its moveable head turning helicoidally into recesses in the receiver.

The mechanism of the C5 rifle is very close to that of the contemporary CS (Chauchat-Sutter) and later CSRG (Chauchat-Sutter-Ribeyrolles-Gladiator) M1915 machine rifles, themselves virtual clones of the 1900 Browning long recoil system.

The magazine projection, streamlined into the stock, was fed by a six-round, Mannlicher-type packet loading clip. The C5 was chambered for the Chauchat-designed 7x59mm cartridge.

Rifle C6

An improvement of the C5. Developed at Puteaux under the direction of Chauchat's patron, General Naquet-Laroque, this pattern became known as the "NL" rifle.

Firming Up the Specifications

Although the initial research was allowed to proceed largely unhindered, it soon became clear from examination of the original prototypes that certain features were desirable while others were not. In order to more closely define the new arm and cartridge being sought, the Small Arms Commission drew up the following specifications, first announced in a military publication of 1905:

List of Conditions for a New Infantry Rifle

1. *Loading: the weapon will use a loader or any other analogous system (five cartridges or more).*
   An automatic reloading principle will be adopted, allowing the firing of the magazine contents by pressing the trigger for each cartridge, without taking the rifle off the shoulder.
   However, the weapon should be able to be used not only as an automatic reloading rifle, but also as a simple repeater. It should allow the loading of single cartridges at any time.
2. *Handiness: the weapon will be simple, strong, and easy to handle in all circumstances. Disassembly and assembly will be done, as much as possible, by hand.*
   The bolt mechanism will be sealed against rain, dust, mud, etc . . The fouling resulting from prolonged firing, executed in normal combat conditions, should not halt the normal functioning of this mechanism.

3 This is why the headstamp 'NL' appears on some experimental cartridges of the time.

The ejection of spent cases should not bother the shooter nor his neighbours.
The soldier's hands will be protected from burns which could result from barrel heat.
The weapon will be equipped with a simple, safe and strong safety which should be easy to use.
Unloading should be able to be done quickly and at any moment.
Finally, the weapon must be able to fire blank cartridges for exercises and manoeuvres.

3. *Rifle weight: should not be above 4.200kg [9.25 lbs] (with empty magazine and without bayonet), and should have a bearable recoil.*
4. *Cartridge weight: calibre - The calibre will not be smaller than 6.5mm. Due to this reservation, the weight of the ammunition will also be as reduced as possible.*
5. *Rifle length: the rifle should have a length so that it can be fired by soldiers standing two rows deep. With its bayonet attached, it need not be shorter than the rifles presently in service.*[4]
6. *Aiming device: the rifle will have a sighting system (corresponding to the combat rear sight) useable always, without any previous operation, and organised so that it is easy to aim for windage. In addition, it must have an aiming device independent to the combat sight, which allows precision firing at all distances.*
7. *Rapidity of fire: must be at least twenty rounds per minute, lying prone.*
8. *Accuracy: the accuracy of the new weapon must be at least equal to that of the present weapons.*
9. *Flatness of the trajectory: the rise of the trajectory curve at 800 metres should not be higher than 1.60m [5.24']. At medium and long distances (up to 1,500m at least), the bullet will have a regularity comparable to the present bullet*[5].
10. *Penetration: penetration will be as deep as possible and at least as much as the present weapons*[6].

Down to the Wire: the Programme of 1909

Even though the general specifications for the new rifle and cartridge had been announced in 1905, it was not until 1908 that the Minister of War gave his colleagues an inkling of the secret autoloading rifle programme which had been under way since 1894, with the prophetic announcement that a decision on the definitive model had not yet been taken, as there were "so many models of rifles, each having important advantages".

In 1909 the Supreme War Council "made it official" by announcing a "Programme for which satisfying the following conditions will lead to new armament for the infantry":

1. *The rate of fire must not be less than 20 rounds per minute from the prone position.*
2. *Maximum weight: 4.200kg (9.25 lbs).*
3. *The rifle must be long enough to permit simultaneous firing from two ranks. With bayonet fixed, it must not be shorter than existing service rifles.*
4. *The rifle must also be capable of firing as a repeater and as a single-shot, and must fire blanks semi-automatically [for training purposes]. The hands of the firer must be protected from burns occasioned by the hot barrel in the course of sustained fire.*
5. *Accuracy and penetration must be identical to those of the M1886-93 [Lebel] rifle to a distance of 1,000 metres.*
6. *The minimum calibre is 6.5mm.*
7. *The maximum chamber pressure must not exceed 4,200kg/cm^2 (59,738 psi).*

The French Research Establishments responded to the conditions of the 1909 programme with new, or at least revised, designs, as follows:

---

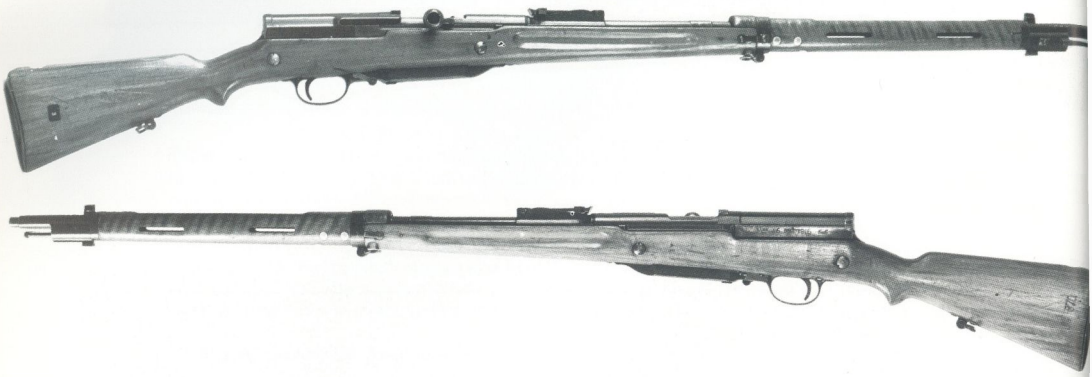
4 The length of infantry rifles of long ago, which seem incredibly unwieldy today, was due to the military tactics in vogue at the dawn of the machinegun era, when two ranks of soldiers fired in simultaneous salvoes. Additionally, with the bayonet attached to the rifle, the resulting pike had to be long enough for the kneeling infantryman to repel a mounted horseman!

5 The mid-range trajectory of the 8mm Lebel cartridge with a *balle* 'D' bullet was 1.43m (4'8") at 600m and 2.97m (9'8") at 800m.

6 ". . The bullet of the 1886 rifle went through a tree and the five men that were hiding behind . ."(Report on the expedition to Dahomey in 1892).

Artillery Technical Section (STA)

Rifle A6



24. Right (above) and left (below) views of the long-recoil Meunier A6 rifle. Overlong and prone to overheating, the 7mm Meunier was the best rifle tested in the 1912 trials.

Originally the STA No 8, the A6 Meunier rifle was undoubtedly one of the most elaborate designs of its time, although its qualities were quite superior to the other prototype autoloading rifles tested up to that time. It became known by the name of its inventor, M. Meunier, a weapons inspection official.

The A6 was presented in 1910 and was officially adopted, but was not then manufactured in any numbers. The A6 was the Artillery Section's entry in the 1911-1912 trials, described below.

In a complete break from Meunier's previous designs, the A6 rifle functioned by long barrel recoil. The bolt was of the Mannlicher type with interrupted lugs, like that of the gas-operated A5 (STA No 7).

Characteristics of A6 Meunier Rifle

action . . . . . long barrel recoil
calibre . . . . . 7mm Meunier

This rifle was made at *Manufacture Nationale d'Armes de Tulle* (MAT) in 1916: as noted in Chapter Two, over a thousand autoloading A6 rifles were produced when introduction of the M1917 rifle was delayed.

total length . . . . . 1.30m (51")
weight . . . . . 4.025kg (8.9 lbs)
magazine type . . . . Mauser (staggered)
magazine capacity . . . . . 6 rounds

A determination to manufacture the A6 Meunier was undertaken in 1913, and perhaps this would have taken place, after some further improvement, if the threatening conflict with Germany had not caused the autoloading rifle programme to be abandoned altogether in the face of far more pressing concerns.

As discussed in Chapter Two, problems with the early version of the M1917 autoloading rifle led to a hasty, if temporary, revival of the A6 Meunier rifle in 1916. Even though the Meunier was more difficult to manufacture than the M1917, over a thousand 7mm Meuniers were made.

Musketry School (ENT)

Rifle B5

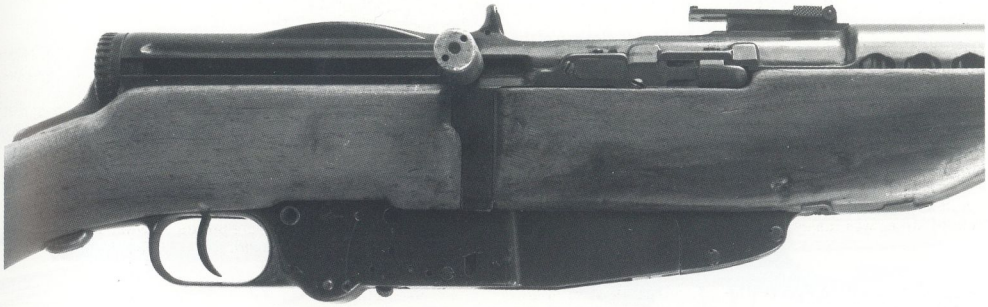
The B5 was a further variant of the pre-trials B4 in calibre 7mm, using the Rossignol direct gas system. The B5 was the entry of the *Ecole Normale de Tir* (ENT) in the 1912 trials, discussed below.

Rifle B6

A further adaptation of the B3 (Belgrand system) in calibre 6.5 or 7mm.

Rifle B7

25. Right side view of the Rifle B7, *Système* Chezaud (short barrel recoil). Calibre 6.5mm; overall length: 1.325m (52"); weight 4.5kg (9.9 lbs).



26. Right side closeup of the B7 rifle, which functioned by a short barrel recoil system designed by Monsieur Chezaud. Heavy and complex, it fired only 365 shots in a 1912 endurance trial conducted at Versailles by Louis Chauchat.

The B7 rifle was a relatively complex model which functioned by the Chezaud system of short barrel recoil. Its bolt featured a twin-lugged rotating head. The magazine took the cartridges in a Mannlicher-type *en bloc* clip. Made in calibre 6.5 or 7mm. Tested at Versailles in 1912 by Chauchat (report follows below).

Rifle B8

27. Right side view of the Rifle B8, which functioned by the Vallarnaud short barrel recoil system. Presented as an improved version of the B7 (Chezaud) rifle, the B8 used a special *en bloc* clip wherein the cartridges were staggered, as in the later Garand rifle.

Also known under the Vallarnaud system, the B8 rifle was presented as a simplified version of the short-recoil B7. Its magazine was loaded by means of a six-round *en bloc* loading clip wherein the cartridges were staggered, as later used by John Garand. Calibre 6.5 or 7mm. Overall length: 1.270m (50"); weight 4.45kg (9.8 lbs).

28. Right side closeup of the B8 rifle, the *Système* Vallarnaud.

Versailles Technical Commission(CTV) and Puteaux Arsenal (APX)

Rifle C7 (the 'NL' Rifle)

29. Also known as the "NL rifle" after Colonel Naquet-Laroque, Louis Chauchat's patron at Puteaux Arsenal. This was the last of its line; an improved version of the long-recoil 7mm C5, capable of taking a bayonet. Length: 1.275m (50"); weight 4.2kg (9.25 lbs). This rifle was featured in the 1912 trials, where it was bested by the A6 Meunier.

The C7 (APX Model 1910) was an improvement of the C6, developed at Puteaux by Chauchat and Sutter in 1908 - 1909 and produced by MAS (*Manufacture Nationale d'Armes de St-Etienne*) in 1910.

Also known as the NL rifle, the C7 was the last long-recoil Chauchat/Sutter autoloading prototype designed before Chauchat was promoted to Lieutenant Colonel and transferred to the St-Etienne plant as Assistant General Manager in 1912. It was featured in the 1911-12 trials (discussed below) under the name 'NL' rifle against the A6 (Meunier) and the B5 (Rossignol).

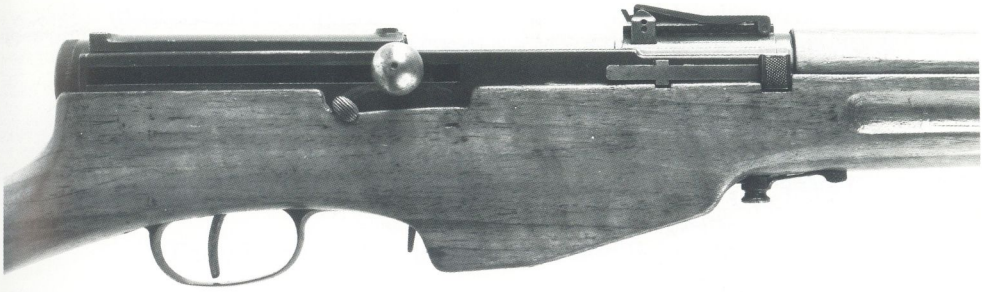
In the C7 the receiver is organised differently; the rear sight is stepped, and the handguard is reduced to half-length. The stock has a semi-pistol grip and the rifle is fitted for a bayonet.

It fires an extremely powerful 7mm cartridge of Chauchat's own design, akin to today's 7mm Remington Magnum, which was loaded with 3.9g (60.1 gr) of smokeless powder to produce a velocity at 25m of 1,040 m/s (3,412 fps).

Characteristics, NL Rifle (APX C7)

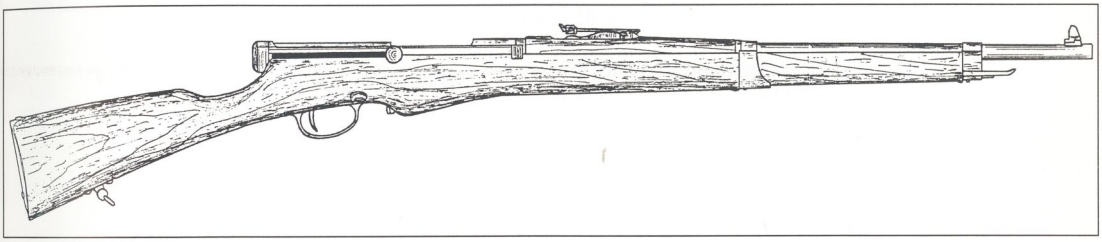
action	long recoil (120mm)
calibre	7mm
total length	1.275m (50")
magazine type	Mannlicher
magazine capacity	6 rounds *en bloc*

At the same time in the FM (machine rifle) category, Chauchat and Sutter had produced the *FM* C6 and its successor, known officially as the *Fusil-Mitrailleur C7 de Puteaux, Système CS, 8mm*. These were *fully automatic* long-recoil designs intended for aircraft use. First subjected to trial in 1911, these CS aircraft machine rifles were the forerunners of the CSRG Model 1915 infantry *Fusil Mitrailleur*, the subject of the Collector Grade title *Honour Bound—the Chauchat Machine Rifle* by Gerard Demaison and Yves Buffetaut.



30. Right side closeup of the NL rifle, a more streamlined version of the C5 and C6, made by *Manufacture d'Armes de St-Étienne* (MAS) in 1910.

Rifle C8



31. The short rifle C8, known as the *Modèle Indochinois* (Indochina Model) due to its dimensional resemblance to an earlier Mannlicher-Berthier repeater. The C8 was chambered for the 8mm Lebel cartridge, and fed by means of a 3-round, *en bloc* clip. drawing by the author

Known as the *Modèle Indochinois* (Indochina Model), because of its proportional similarity to the Mannlicher-Berthier Model 1902 short bolt-action repeater dubbed the "Indochina Skirmisher". The C8 autoloading rifle functioned by a short barrel recoil system, also developed by Chauchat, and was chambered for the 8mm Lebel cartridge.

The C8 short rifle was tested by different troop corps and at one time, there was a possibility of using it to equip balloon and aeroplane crews.

Characteristics, C8 (Indochina Model)

action	short recoil
calibre	8x50R Lebel
magazine type	Mannlicher
magazine capacity	3 rounds *en bloc*

Establishing the Lineup

Originally classified SECRET, the circa-1912 document reprinted on the following pages was the first to list and categorise all the prototype machine rifles and autoloading rifles that had been developed by each of the research establishments up to that time. This was done by assigning the consecutive letter/number identifier (which we have already used, above) to each arm, in chronological order of development. Note that, as with the STA No 4 rifle and STA No 4 carbine described above, the same designations are *re-used* to describe CTV/APX machine rifles *and* autoloading rifles. (This category-oriented system is still in use in the French Army today, where the designation "F1" can refer to a rifle, several cartridges, a shirt, or a jet fighter.)

Letter/Number Identification of Automatic Arms under Study

For identification purposes the automatic arms under study will be designated by a letter and number in the chronological order of their development, as follows:

- *A for the Artillery Technical Section (STA)*
- *B for the Musketry School (ENT)*
- *C for the Versailles Trials Commission (CTV) and Puteaux Workshops (APX)*
- *D for others*

The automatic arms being studied are divided into the following categories:

1. *machinegun*
2. *machine rifle (FM;* fusil mitrailleur)
3. *[autoloading] rifle, carbine or musket*
4. *pistol*

In consequence, the following designations are adopted:

1. Machinegun

None; no machinegun was included in the study.

2. Machine Rifle

STA: none.
ENT: the original [ca 1900] 6mm B1 machine rifle with Rossignol [direct] gas system [fig 21]

CTV/APX:

C1 long-recoil 8mm machine rifle , developed in 1903 at Versailles (CTV No 1)
C2 the same model in 8mm (1904)
C3 long recoil 8mm machine rifle from Puteaux (APX No 3) (1905)
C4 long recoil 8mm machine rifle from Puteaux (APX No 4) (1905)
C5 long recoil 8mm machine rifle from Puteaux (APX No 5) (1906)
C6 long recoil 8mm machine rifle studied under direction of General Naquet-Laroque at Puteaux (1908)
C7 8mm machine rifle, CS system, from Puteaux (1911)

2. Rifle, Carbine or Musket

STA:

A1 gas operated 6mm rifle (STA No4) (1897) [fig 14]
A2 gas operated 6mm rifle (STA No 5) (1899)
A3 gas operated 6mm rifle (STA No6) (1900)
A4 gas operated 6mm carbine (STA No 1) (1900) [fig 15]
A5 gas operated 6.5mm rifle (STA No 7) (1906) [fig 17]
A6 long recoil 7mm rifle (STA No 8) (1910-1911) [fig 24]

ENT:

B1 original ENT 1901 model in 6mm with Rossignol gas system [fig 19]
B2 ENT model in 6.5mm using Rossignol gas system
B3 ENT model No 2 in 6.5mm using Belgrand short-recoil system
B4 ENT model in 6.5mm using Rossignol gas system
B5 ENT model in 7mm using Rossignol gas system
B6 ENT No 3; 6.5 or 7mm, Belgrand short-recoil system
B7 6.5 or 7mm Chezaud short-recoil system [fig 25]
B8 6.5 or 7mm Vallarnaud short-recoil system [fig 27]

CTV/APX:

C1 originally the CTV No 1: long-recoil, developed [by Chauchat] at Versailles in 8mm Lebel (1903)
C2 originally the CTV No 2 and No 2a: long-recoil, 6.5 or 7mm. Cartridges and rifle developed [by Chauchat] at Versailles, 1903

C3 originally the APX No 3: long-recoil,7mm. Developed [by Chauchat and Sutter] at Puteaux, 1904
C4 originally the APX No 4: a development of the C3 (1905)
C5 long-recoil 7mm rifle studied [by Chauchat and Sutter] under the direction of General Naquet-Laroque, and known as the NL rifle. Puteaux, 1906 [fig 22]
C6 modification of the original NL rifle in 7mm; Puteaux
C7 modified, autoloading long-recoil NL rifle in 7mm. Puteaux, 1908 - 1909 [fig 29]
C8 short-recoil Chauchat-Sutter design in 8mm Lebel calibre. Type Indochinois *[fig 31].*

Evaluating the "First Wave": the Trials of 1911 - 1912

Early Eliminations: the Chezaud and Belgrand Rifles

A series of comparative trials was organised in 1911 and 1912 at Satory and the Musketry School of Châlons-sur-Marne, to test the latest models from each of the four research establishments.

Louis Chauchat was by this time a *Commandant* in the Artillery, and a very busy man. Not only was he involved in design work at Puteaux, he was also in charge of weapons testing at Versailles.

Three months before his promotion to Lieutenant Colonel and his transfer to St-Etienne as Assistant General Manager, Chauchat oversaw a trial of four developmental rifles. The following excerpts are from his confidential report, written in his own hand and dated May 10, 1912:

. . Conclusions

The rifle of Captain Belgrand fired 20 shots; that of M Chezaud fired 365 shots; that of Capt Chauchat and M Sutter fired 2,400 shots; that of M Meunier fired 3,000 shots.

The first two rifles are not yet perfected.

The third had to suspend firing after 2,400 rounds due to an incident (rupture of the receiver tang) not caused by the action: a similar rifle fired 3,114 shots in 1912 without incident. Nevertheless the high incidence (7%) of failure of the barrel to return to battery is not acceptable and it seems indispensable that the inventors make the necessary modifications before retesting this design . .

The Meunier rifle fired 3,000 shots without serious incident. Incomplete barrel returns were few (0.7%), while incidents of the bolt closing on an empty magazine were more numerous (5.1%) . .

The Three Final Contenders

The following three rifles were featured in a decisive, final trial in the summer of 1912 at Châlons Camp, :

- the 7mm Chauchat/Sutter C7 long-recoil rifle from APX, generally known as the 'NL' rifle;
- the 7mm B5 from ENT (Châlons), featuring the Rossignol direct gas system;
- the 7mm gas-operated A6 Meunier from STA (Artillery Technical Section), previously known as the STA No 8.

The trials were conducted under the direction of Captain Tête of the 29th Infantry Regiment. Capt Tête's report of this trial, dated July 1, 1912, reads as follows:

Camp de Châlons, July 1, 1912

Ecole Normale de Tir
Commission d'Experiences

Report

On Practical Trials of the Rifles
NL — STA — ENT

. . Although the weapons tested did fire, there were far too many stoppages for us to desire to adopt one of them as an infantry rifle. The practical tests have served to establish some facts which can be used by the manufacturers.

The three rifles which were presented belong, under the point of view of automatic function, to two different systems:

- *rifles functioning by barrel recoil: NL [APX] rifle*
- *rifles functioning by gas: ENT [B5 Rossignol] and STA [A6 Meunier] rifles.*

The NL rifle, which functions by barrel recoil, was very complicated. Deformations of the stock, caused by humidity or heat, could stop it. The recoil of the barrel and its return to battery caused such a general jarring of the rifle that it inconvenienced and bothered the shooter.

In the STA and ENT gas operated rifles, the mechanism is simpler. But as the opening is quicker, if the chamber and case dimensions have not been carefully determined, a detrimental sticking of the case to the chamber was to be feared, hampering the opening of the bolt.

These gas operated rifles are too sensitive to variations in pressure, recognising that these variations can be caused by the outside temperature or by barrel heating.

Additionally, the rifles presented are different in their loading systems: the NL rifle requires that the loading clip be inserted into the rifle; the STA and ENT use stripper loading clips.

Inserted loading clips are advantageous due to fast reloading. On the other hand, they are inconvenient because of their weight and the opening they require at the bottom of the magazine for their expulsion. Finally, the rifle cannot fire as a repeater or automatically if loading clips are unavailable.

Stripper loading clips are light, they allow a complete closing of the magazine bottom and are not essential for the use of the weapon. They do present the inconvenience of a more difficult operation.

Both systems frequently place the cartridge poorly into the chamber, causing stoppages.

We have noticed that all three models had a large proportion of stoppages caused by their repeating systems. Because of the rapidity of movement of the bolt, this mechanism must be designed with more care on an autoloading weapon than on one operated by hand.

The presented rifles are easily maintained; disassembly and assembly are relatively fast; they handle well and are ready to be used in all circumstances of combat.

Although they are quite robust, and one need not worry about dust and the introduction of foreign objects while crossing a forest, they do demand certain precautions if one has to crawl through ploughed fields. Under these conditions, rifles with an incorporated charger clip have proven to be inferior to others because of the opening at the bottom which allows dirt to enter.

Except for the STA rifle, the heating caused by firing an uninterrupted string of one hundred cartridges did not foil the use of the rifle for bayonet combat.

The number of stoppages during the tests were about the same for the ENT and NL rifles and slightly higher for the STA rifle:

- *ENT rifle [B5 Rossignol] : 3.00%*
- *NL rifle [Chauchat/Sutter long recoil]: 3.77%*
- *STA rifle [A6 Meunier]: 5.1%*

Most of the stoppages were without importance and firing resumed after a very short time. Nevertheless, they were of such quantity that they did not allow the required rate of fire of twenty cartridges per minute.

To train the men in the use of the autoloading rifle will require the use of a relatively high number of cartridges. Also, the insufficient shooting ranges available to the troops will make instruction difficult if the rifles are not equipped with a device that permits automatic functioning with blank cartridges. It is not possible for the Commission to declare on the convenience of providing an automatic rifle to all soldiers or to limit its use to the best shooters.

The poor ballistic qualities of the ammunition did not allow a determination of the efficiency of the combat rear sight at different distances.

Conclusions

The Testing Commission of the Musketry School thinks that it is convenient to draw the attention of the manufacturers of these automatic rifles to the following points:

- *cartridges are generally poorly guided in their transfer from the magazine to the barrel.*
- *the bottom openings that exists in rifles with introduced* [en bloc] *charger clips are incompatible with the use in combat of automatic rifles.*
- *in those rifles with stripper clips, the placement of the clip [to strip the cartridges into the magazine] should be easier. Closing of the bolt should be ensured upon withdrawal of the [empty] stripper clip.*

• certain parts of the bolts in the ENT and NL rifles are too small and can be lost during cleaning or when billeted.

Some parts are too weak and require reinforcement:

• on the NL rifle: the ejector and the sleeve which closes the rear part of the receiver.
• on the ENT rifle: the bolt cotter-pin and the bolt.
• on the STA rifle: the extractor and the cocking handle.

It is essential that these rifles reload automatically with blank cartridges so as to provide instruction.

The Commission is of the opinion that it would not be advantageous to use several types of fire (single shot; manual repeating; autoloading). The only way to obtain total performance from the rifle and avoid jamming due to human error, consists in requiring the shooter to perform some simple movements, always the same, so that he will do them automatically.

For the same reasons, it is of the opinion that a loading system should be adopted using a fully loaded charging clip, excluding loading by individual cartridges.

Summing Up the "First Wave"

As can be seen, an autoloading rifle was not yet ready for adoption, because the prototypes were not fully developed. It must be stated that the mechanisms had been made unneccessarily complicated by devices to ensure that each rifle would work both single-shot and as a manual repeater as well as an autoloader, these devices having been insisted upon due to fears of exaggerated expenditure of ammunition.

In addition, strict control over uniform cartridge dimensionality during manufacture, essential for reliable functioning in any autoloading arm, had not yet been attained.

Regarding certain parts of Captain Tête's report, especially where he discusses the "simple movements" best adapted to troops and their training, it should be noted that at the time most recruits in the French Army were farmers with limited education: a three-year period of obligatory military service was required to implant the required training and transform them into fighting men.

A Soft Decision

After the trials, in 1913, consideration was given to manufacturing the A6 Meunier rifle (which had already been adopted in 1910), but the gathering spectre of imminent conflict with Germany froze these efforts and soon caused the entire "First Wave" autoloading rifle programme to be abandoned (although the Meunier rifle did not entirely disappear, as we will see in the next chapter).

More than the technicalities, it was the financing of the replacement of all the rifles for the troops which seemed most daunting. The value of manufacturing three and a half million rifles and their corresponding stocks of ammunition was set at six hundred million gold francs[7].

Other French Automatic Rifles

During the pre-World War I period several other autoloading rifles, which did not belong to any of the "families" previously mentioned, were designed and manufactured in France. Several of these are discussed below (in alphabetical order), but first the most important 'other' model, the RSC rifle, is described.

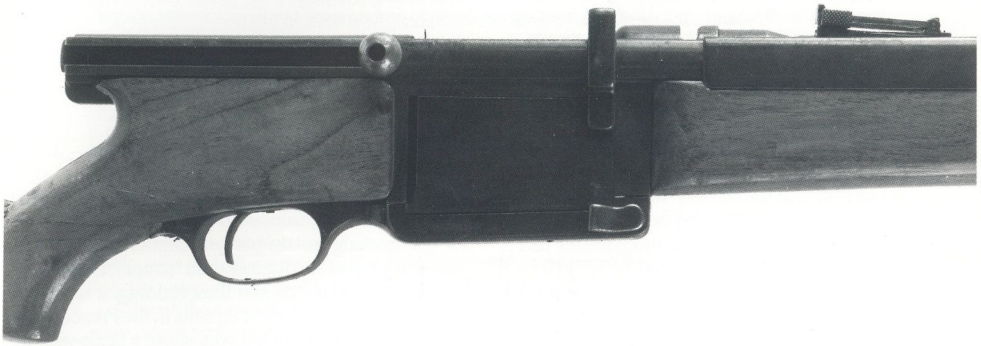
The RSC rifle also came from the prolific team of Chauchat and Sutter, now joined by Monsieur

7 The expenditure was valued at five hundred million gold francs for the rifles and one hundred million for the ammunition, which means a cost of about 150 gold francs per rifle. At that time the equivalent of 150 gold francs was 29 gold US dollars (with gold at $20.00 an ounce).

32. Right side view of the unidentified gas-impingement design produced in prototype at Puteaux Arsenal in calibre 6mm; possibly a forerunner of the RSC rifle.

Overall length: 1.270m (50"); weight: 4.250kg (9.4 lbs); calibre: 6mm; magazine capacity: 6 rounds.

Note the vertical screw, under the forestock about 10cm (4") from the front: this is in the identical position to the gas port cleanout screw on the *Modèle* 1917 RSC rifle (fig 50).



33. Right side closeup of the unidentified gas-operated APX rifle, possibly a forerunner of the important RSC design, discussed below.

Ribeyrolles, the manager of *Usines Gladiator*, the bicycle and motorcycle company which had secured the prime contract to manufacture the CSRG M1915 machine rifle.

An unidentified gas-impingement design, produced in prototype at Puteaux Arsenal in calibre 6mm, may well be an early prototype of what became the RSC rifle. It has a two-piece stock, and functions by bleeding gas into a cylinder under the barrel. The bolt carrier contacts the front-locking, rotating bolt head via a stirrup. A steel handguard straddles the rear sight. The forestock resembles that of the Lebel.

The RSC Rifle

The RSC rifle was developed by a team led by Monsieur Ribeyrolles, the General Manager of *Usines Gladiator*, which by this time was mass-producing *Modèle* 1915 CSRG machine rifles for French (and later American) forces. (Little is known about Monsieur Ribeyrolles, but not only did he convert his factory in double-quick time from the manufacture of bicycles and motorcycles to that of machine rifles, but he himself designed several state-of-the-art, special-use weapons, discussed in Chapter Two.)

By this time the health of Louis Chauchat had been severely undermined by the powder fumes he had been forced to breath during the endless series of rifle trials he had conducted, and he had little more than a year to live. As the initials indicate, with the RSC rifle Chauchat finally passed the torch to Ribeyrolles and Chauchat's own longtime assistant, *Contrôleur d'Armes* Sutter.

In a move which was to assume supreme importance during World War I, the RSC rifle was chambered for the standard 8mm Lebel cartridge. The RSC was first presented in time-honoured French tradition as a "kit" capable of transforming the government's huge stock of obsolete 8mm Lebel rifles into autoloaders, although in actuality very few Lebel parts were utilised. As discussed in Chapter Two, the RSC was adopted as the wartime M1917 autoloading rifle.

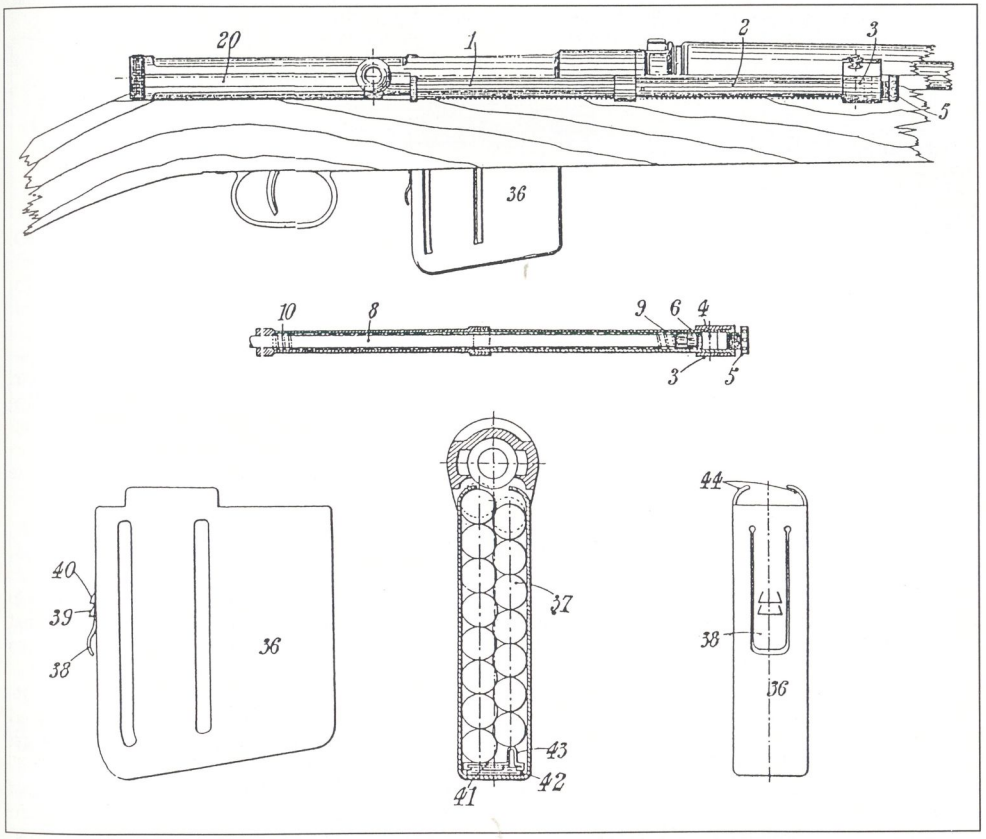
The Berthier Autoloading Rifle (1903)

André Berthier, an ex-officer of the Belgian and French Armies, entered the service of the Turkish government with the rank of General and the title *Pacha* (Pasha). General Berthier-*Pacha* developed a number of autoloading and fully-automatic weapons which were experimented with by French forces at the beginning of the century. He relocated in the USA in 1916, in order to further his machine rifle development. His design was purchased by the British firm Vickers Ltd, and was later manufactured in England, and in India, as the Vickers-Berthier.

General Berthier-*Pacha* is not to be confused with Monsieur A Berthier, the engineer with the Algerian railroad, who designed the Mannlicher-Berthier series of bolt-action rifles and carbines.

General Berthier-*Pacha* designed three autoloading rifles, known as the *Modèle* 1900, the *Modèle* 1903 No 1, and the *Modèle* 1903 No 2, all constructed by *Manufacture Nationale d'Armes de St-Etienne* (MAS). The Berthier *Modèle* 1900 was tested by the Versailles Trials Commission in 1902.

In this gas-impingement design the cylinder was located on the right side, the gas takeoff being directly



34. Figures from André Berthier's 1904 patent No 343,711.

Above: fig 8, showing position of gas tube (1) on the right side of the receiver.

Centre: Fig 11, cutaway view of gas piston assembly. Note the gas takeoff position, directly in front of the chamber.

Below, left to right: three views of the detachable box magazine. Right side, showing catch; rear view in place, showing receiver and boltway; and rear view. courtesy INPI

in front of the chamber. The cylindrical, front-locking bolt turns helicoidally to lock two opposing lugs into recesses in the receiver.

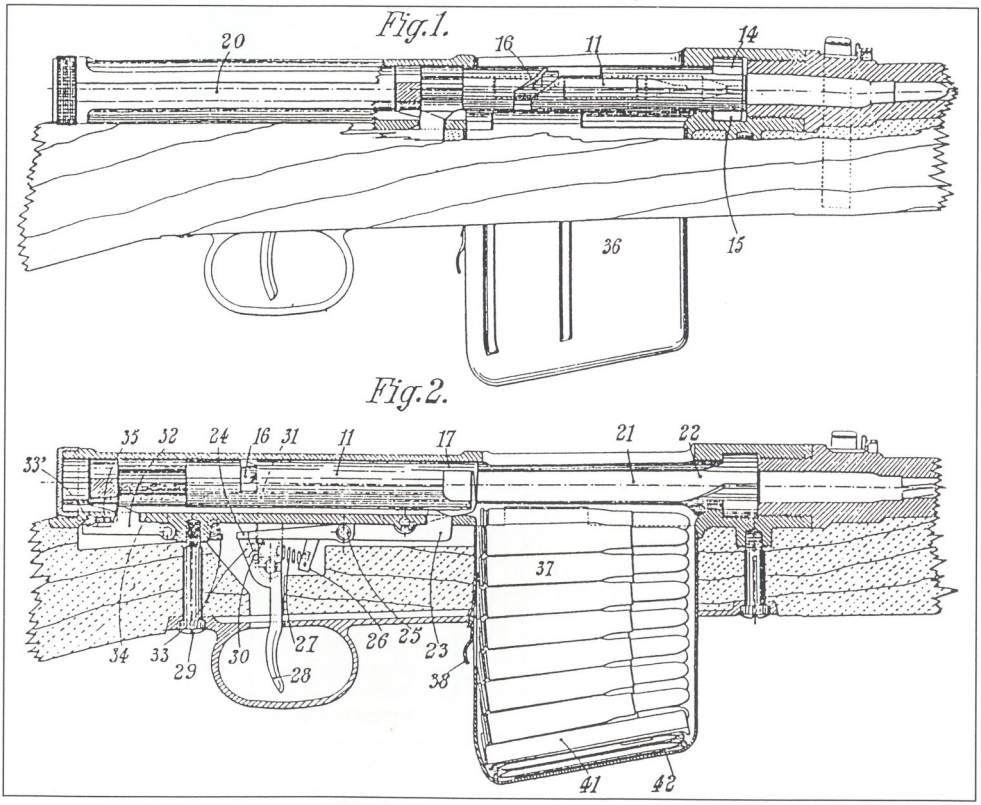
The Model 1903 rifles, which evolved from the Model 1900, differed in several details. The No 1 was fed from a five-shot box magazine, and the No 2 from a 10-round box. Both rifles could be recharged by means of five-round stripper clips.

The Model 1903 rifles fired a special 6.5x55.5mm cartridge fitted with a cylindro-ogival bullet, especially manufactured to General Berthier's specifications by SFM (*Société Française de Munitions*). (SFM manufactured several other Berthier-designed bullets, including round-nose and spitzer loads for the 7mm Mauser, round-nose and spitzer loads for the 7.65mm Mauser, and a 7.5mm bullet for an unknown case.)

Both Model 1903 Berthier rifles could be fitted with cruciform-bladed bayonets carried in permanent housings under the barrel, the installation of which was made simpler on the No 2 rifle.

The two Berthier model 1903 rifles were accorded a two-month trial at Versailles from October to December, 1903, which revealed that the design was simple and functioned satisfactorily, but a great number of features were found capable of further improvement.

General Berthier-*Pacha* requested a patent for his automatic rifle on June 4, 1904, which was awarded later that year on August 13th under number 343,711. It described a rifle which functioned by gas action, further ameliorated and fed through a vertical box magazine introduced through the bottom, containing fifteen cartridges.



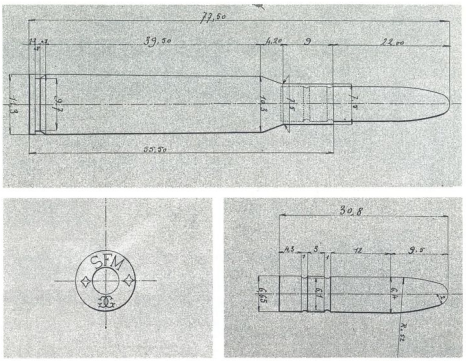
35. Figures from André Berthier's 1904 patent No 343,711.

Above: patent fig 1: action partially cut away to show the two front lugs on the rotating bolt (14), and the unlocking cam which mates with the stud (16) on the firing pin/operating rod assembly.

Below: patent fig 2: action cut away to show contents of staggered, 15-round box magazine, and trigger mechanism. Bolt unlocked and held open. courtesy INPI

Characteristics, Berthier Model 1903 No 1

calibre	6.5mm
cartridge	6.5x55.5
bullet weight	9.33g (144 gr)
charge weight	2.53g (39 gr)
total cartridge weight	22.7g (350.3 gr)
velocity at 25m	780m/s (2,559 fps)
overall length	1.283m (50.5")
length with bayonet	1.708m (67.2")
weight	3.830 kg (8.44 lbs)
magazine capacity	5 rounds



36. The special 6.5x55.5mm cartridge made by SFM to General Berthier-*Pacha's* specifications for his autoloading rifle of 1903, shown actual size.
Above: dimensioned side view of complete round.
Below, left: 'SFM' headstamp of *Société Française de Munitions.*
Below, right: dimensioned cylindro-ogival bullet.
courtesy CAA

The Chossé Rifle

On March 26, 1912, Monsieur Chossé, a Weapons Inspector at *Manufacture Nationale d'Armes de Châtellerault* (MAC) proposed an automatic rifle of his invention to the Artillery Inspection Branch.

MAC manufactured a prototype of the Chossé rifle which was presented to the Testing Commission in Versailles (CTV) in June, 1913. During the tests the follower spring broke and so ended prematurely the development of the rifle.

The Chossé rifle functioned by short recoil of the barrel. It fired the 8mm Lebel cartridge, and had a magazine capacity of five rounds. Total length was 1.310m (51.6"), and weight 4.660kg (10.3 lbs).

In the 1920s, Monsieur Chossé collaborated with Colonel Reibel on the design of the FM M1924-29 Châtellerault machine rifle.

The Clair Carbine

As mentioned earlier, a carbine designed by the Clair brothers was presented for trial at Châlons Camp on July 5, 1898. Featuring a particularly modern-looking silhouette for its day, the Clair carbine had a one-piece stock and functioned by gas impingement, with a cylinder mounted under the barrel. A connecting rod relayed the gas impulse to the operating rod/cocking handle by means of a coupling which could be disengaged to allow manual operation. The operating rod return spring was located inside the gas cylinder.

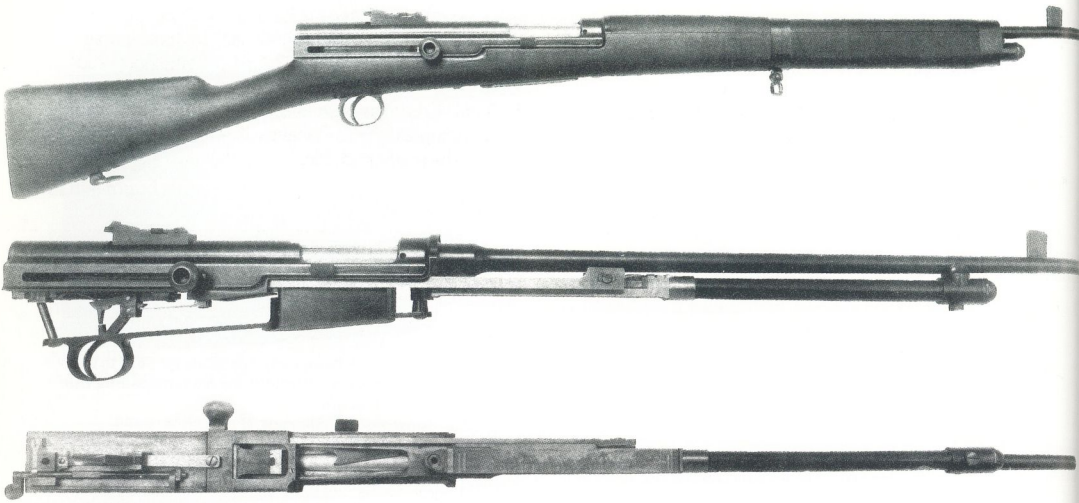
The bolt resembled a prismatic block with a locking shoulder below, and was fitted with a recoil spring.

The Clair was chambered for the 7x57mm Mauser cartridge, and fed from a five-round, staggered-feed magazine fitted into the stock, wherein the follower held the bolt open when the magazine was empty. It could be loaded with loose rounds or by using a 5-round Mauser clip charger.

Characteristics, Clair Carbine

action	gas impingement
calibre	7mm
cartridge	7mm Mauser
overall length	1.092m (43")
barrel length	.520m (20.5")
weight	4.450kg (9.8 lbs)
magazine capacity	5 rounds

Some features of the Clair carbine resemble those of the later Mondragon rifle very closely, especially the internal mechanism. Interestingly, a relationship did exist: the Clair Brothers served as intermediaries between the Mexican Manuel Mondragon and SFM for the procurement of ammunition.

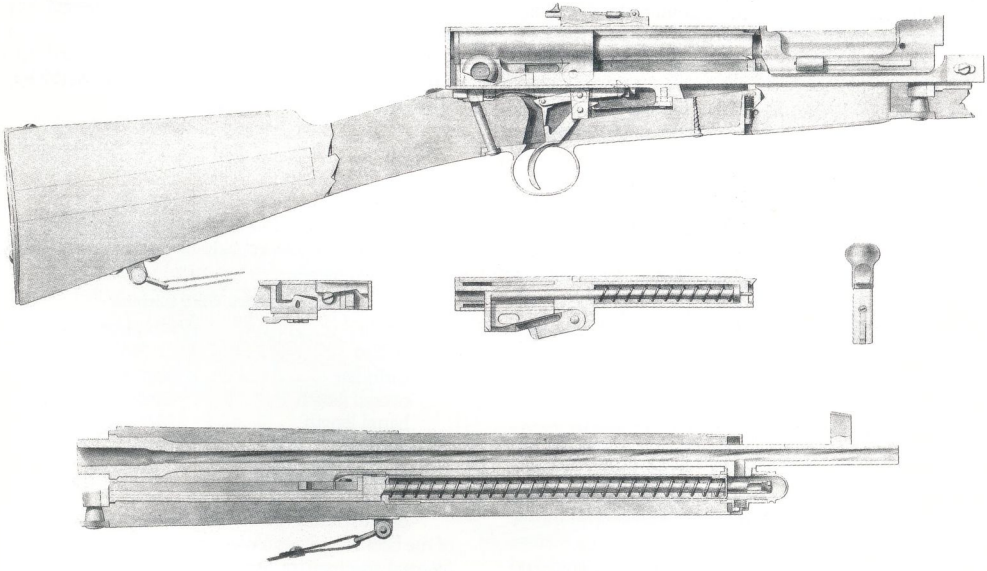


37. Three views of the Clair carbine, showing features remarkably similar to those of the later Mondragon rifle, patented in 1907. Above: right side view.

Centre: right side view of barreled action stripped from stock, showing gas cylinder (front) and piston.

Below: bottom view of barreled action. Note the unusual cartridge feed guide (reminiscent of that used with the drum magazine of the Lewis light machine gun), which was ill-thought-out and the cause of many stoppages.

courtesy CAA

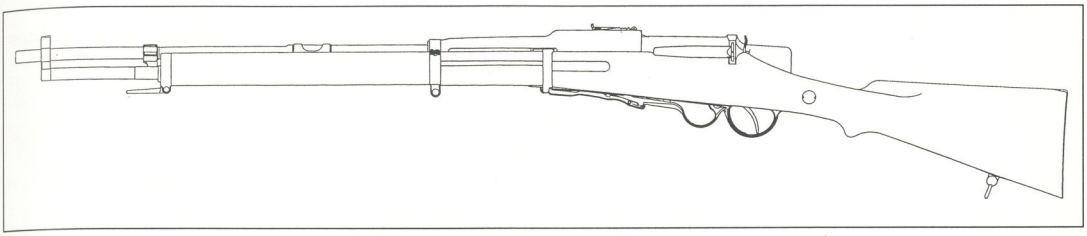


38. Features of the Clair carbine. From top: cutaway view of action, showing bolt locked in rearmost position; features of bolt and cocking handle; barrel and gas system. Note the gas piston spring, *inside* the gas cylinder. courtesy CAA

In the course of examination by the military it was pointed out that a disadvantage of the gas impingement system (over short- or long-recoil) was a reduction in muzzle velocity of about 3%, which was judged excessive. The feed system of the Clair carbine was found to blame for many of the considerable number of stoppages recorded, and the mechansim itself was adjudged complex, easily fouled, and "delicate" to disassemble.

In his conclusions *Capitaine* Lecomte, the author of the report on trials of the Clair carbine, recorded that the Trials Commission had rejected the arm, not only for its complexity but because it was altogether too heavy to be easily portable.

The Hastron Rifle



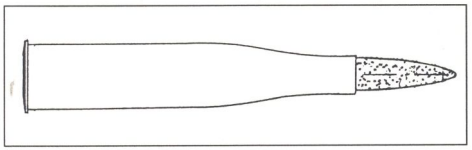
39. Left side view of the Hastron rifle, which functioned by a novel gas-operated blow-forward barrel system. Calibre 6x61R. courtesy CAA

The Hastron rifle was tested in 1900 and 1901. Its design, at once ingenious but impractical, used a gas impingement system which pushed the barrel forward.

The one-piece stock had a semi-pistol grip; the handguard partially covered the barrel. It has no bolt or magazine. The six cartridges were held in place by a specially designed feeding clip, placed crosswise, similar to the rigid band of the St-Etienne heavy machine gun.

When fired, gas pushed the barrel forward and the feeding clip or "band" moved one notch. When the barrel returned to battery, another cartridge was introduced automatically into the chamber. The firing pin was placed on the ready notch during the closing movement. There was no extraction or ejection.

After the last cartridge had been fired the clip, with its empty cases attached, was ejected and the barrel remained in its forward position. A lever, similar to that of the American Peabody rifle, located in front of the triggerguard, was used to make the barrel go forward from the rearmost position to load the first round.



40. The 6x61R Hastron cartridge. courtesy CAA

The Hastron rifle used a special 6x61mm cartridge with a rimmed, bottle-necked case with a well-rounded conical shoulder, firing a pointed bullet.

Chapter Two

Caught Short in World War I

France entered a most murderous conflict in August, 1914 which was to last for four years.

In spite of all their prewar testing, none of the belligerents had an autoloading rifle ready for issue when the war broke out. As for France, the soldiers went to war with a mismatch of outdated repeater rifles, designed fifteen to twenty-eight years previously.

The war of movement of the first weeks was followed by a war of position, where the warring parties protected themselves by digging ever more elaborate networks of trenches. It was not possible to send out the cavalry to find out how the enemy was entrenched, but somehow, before each military operation, one had to know how the enemy forces were deployed. For this intelligence, the arrival of the aeroplane as an observation platform was a godsend, although it had not yet become a combat machine.

On the Western Front, French and German aerial observers soon started shooting at each other with pistols and revolvers, then with carbines. The first air victory went to the French: Lieutenant Quenault, the observer in an airplane piloted by Lt Frantz, killed a German pilot who came too close with a single bullet to the head, using a Mannlicher-Berthier M1890 carbine.

Increased firepower for aircraft soon became an urgent priority. Everyone was looking for a weapon that could provide a high rate of fire during the brief periods when enemy aircraft were within range. However, tests done before the war had indicated that the fragile airframes of those days could withstand neither the weight nor the heavy recoil of machineguns. The war was soon to bring much stronger aircraft, but as an interim compromise, autoloading carbines were used.

Since none of the warring nations had yet issued a light autoloading rifle, civilian manufacturers were the only sources that could provide the needed armament quickly. The German air service started using the Mondragon rifle, designed by Mexican General Manuel Mondragon and manufactured in Switzerland by *Société Industrielle Suisse* (SIG). Meanwhile, the French bought commercial Winchester 1907 and 1910 carbines from the United States.

Winchester Model 1907 and 1910 Carbines in the French Air Service

41. The commercial Winchester Model 1907 carbine, purchased by the French General Staff and issued to air crews early in World War I.

The Winchester Company, of New Haven, Connecticut, became world famous for the production of repeating carbines. The company first entered the semi-automatic field in 1903, marketing a small autoloading carbine developed by a Winchester employee named Thomas Crossley Johnson, which functioned on the blowback principle and featured a tube magazine in the buttstock which held 10 special, wide-rimmed .22 rimfire cartridges.

A heavier, magazine-fed autoloading carbine was introduced in 1905, available in .32 and .35 centrefire calibres. Two additional models were brought out

which fired even more powerful cartridges: the model 1907, firing a cartridge named the .351 Winchester Self Loading, and the model 1910, which fired a .401 calibre cartridge.

The French General Staff, unsatisfied with what was available locally, purchased an undetermined number of these commercial Winchester 1907 and 1910 carbines for issue to air crews[1].

The Winchester model 1907 and 1910 carbines were fitted with two-piece stocks, the receivers having the ejection port on the right side.

The bolt, necessarily heavy due to its unlocked blowback action, was designed to function in the comparatively short, slim receiver by carrying a good part of its weight in an integral front extension lodged inside the forearm. A cocking rod, which protrudes from the front of the forearm tip under the barrel, contacts this front bolt extension when pushed back.

Feeding is through a box magazine of five or ten cartridges. The rear sight is crude and the carbine looks more like what it is—a hunting arm—than a military weapon.

Winchester carbines purchased by the French air service were stamped "ARMÉE FRANÇAISE" (French Army) with two crossed flags on the left side of the receiver. They were used by aviators at the beginning of the war, before being replaced by machineguns as these became available, after which the Winchesters remained in limited service with ground forces. In certain cases, a lug was welded to the barrel to accept the M1892 musket bayonet, and/or sling swivels were installed.

These carbines were delivered with American ammunition, but France manufactured both the .351 and .401 Winchester Self Loading cartridges in 1916 and 1917[2].

Characteristics of Winchester Carbines

	Model 1907	Model 1910
action	blowback	blowback
calibre	.351 WSL (8.8x35mm)	.401 WSL (10.3x38mm)
total length	0.912m (35.9")	0.912m (35.9")
barrel length	0.508m (20")	0.508 (20")
weight	3.5kg (7.7 lbs)	3.7kg (8.1 lbs)
magazines	5 or 10 rounds	5 or 10 rounds

Between a Rock and a Hard Place

The use of Winchester carbines was only a limited episode during the first months of World War I, when the General Staff was still of the opinion that automatic rifles (autoloaders and machine rifles) were undesirable and would lead to the expenditure of too much ammunition.

By the late fall of 1914 the networks of trenches became more firmly established, and the war changed quickly from one of movement to one of stagnation, due to the machinegun impasse. French troops were sustaining increasingly alarming losses from German Maxim MG08s, against which frontal assault by cavalry and infantry had been found to be literally suicidal.

Raiding techniques were developed, wherein a small group advanced from different sides of a machinegun nest, ideally keeping the gunners' heads down with brief but heavy bursts of fire until close enough to silence the nest with rifle grenades. In this daringly deadly business, the need arose for a weapon more portable than a heavy machinegun, but capable of highly concentrated firepower for brief periods of time. Indeed, from the start of the conflict, many had expressed regret in not having an autoloading rifle firing the 8mm Lebel cartridge in the hands of the troops.

As noted, however, the prewar "first wave" of autoloading rifle trials had been abandoned in 1913, with the reasoning that a nation did not begin rearming her soldiers on the eve of battle. Significantly, all of the "first wave" trials had involved new, rimless cartridges, as it had been recognised at the highest level that the Lebel cartridge case was obsolete.

By the time France had been at war for a year, significant changes had taken place in General Staff thinking, and men like Louis Chauchat were getting a

1 The French Purchasing Commission in the United States also ordered Winchester .30-30's and contracted with Remington for the manufacture of Model 1907/15 bolt-action rifles as well as single-shot Rolling Block rifles in 8mm Lebel.

2 Made in France by *Ecole Centrale de Pyrotechnie à Bourges* (Central Pyrotechnical School in Bourges); headstamped "ECP".

better hearing. But, when the General Staff finally recognised the usefulness of an autoloading rifle using the 8mm Lebel cartridge, nothing was ready.

To the Rescue (Almost): the 8mm Lebel Calibre RSC Rifle

Fortunately, French engineers Ribeyrolles, Sutter and Chauchat were able to quickly produce prototypes of such a rifle.

By this time the 8mm Chauchat Machine Rifle (the CSRG Model 1915) was in production at *Usines* Gladiator (before the war a successful automobile and bicycle manufacturer) which was managed by a Monsieur Ribeyrolles, hence the initials 'CSRG' (Chauchat, Sutter, Ribeyrolles, and Gladiator). As the initials indicate, the RSC rifle was designed by the same team, with Monsieur Ribeyrolles obviously taking a much larger part than before.

As noted, the RSC rifle was first presented as a "kit", in this case intended to convert the government's large stocks of obsolete M1886-93 tube-loading Lebels into autoloading rifles. In the actuality, however, only the stock, forearm, and stock fittings of the Lebel were used. The M1886-93 Lebel barrel would have done, but it was no longer in production; so barrels made for the M1916 Mannlicher-Berthier bolt-action rifle were used instead.

A gas impingement mechanism was added, the piston assembly taking the place of the tubular magazine in the forend. A new receiver and magazine were derived from pre-war prototypes designed by Louis Chauchat, by this time Colonel Inspector of Small Arms in the Industry, and his assistant, Administration Officer and Weapons Supervisor Sutter.

Produceable prototypes were ready in 1915, but tooling up and ironing out some of the more obstinate 'bugs' in the design, described as the "lack of resistance of some parts to hard use", delayed the start of manufacture. In addition, French factories were already working to capacity producing existing war *matériel*.

Nevertheless, the 8mm RSC rifle was adopted in May, 1916 as *Fusil Automatique Modèle* 1917 (Model 1917 [Semi-] Automatic Rifle), although problems persisted, eventually delaying the beginning of series manufacture of the M1917 until April, 1917.

Meanwhile, it was urgent to fill the gap: foreign commercial arms were no longer satisfying the requirements.

The Return of the A6 Meunier: the 7mm M1916

Thus the spotlight fell again on the 7mm Meunier rifle, as the determination for its manufacture had already been taken.

As described in Chapter One, *Manufacture Nationale d'Armes de Tulle* (MAT) had been ordered in 1913 to begin manufacture of the A6 Meunier rifle, which had previously been tentatively adopted in 1910. It is unknown if the 1913 order was for mass production or only enough rifles for an exhaustive troop trial, but in any event the project had been abandoned.

As the Small Arms Commission no longer evinced interest in his rifle, the resourceful Etienne Meunier had requested a patent for it on October 4, 1915. The request was presented by the law firm Hippolyte Josse, but although the patent was granted under No 502,478, it was not made public until 1920.

In the face of urgent requirements and delays in implementing the 8mm M1917 autoloading rifle, a small "stopgap" series of 7mm M1916 Meunier rifles was manufactured in 1916, with the three State arsenals (MAC, MAS and MAT) participating. Châtellerault furnished rough forgings of the bolt and also other parts for the sword-bayonet; Tulle manufactured most of the parts and oversaw final assembly.

Description of the M1916 Rifle

Characteristics, M1916 Meunier

action	long barrel recoil
calibre	7x56.95mm Meunier E 7
total length	1.295m (51")
total length with bayonet	1.690m (66.5")
barrel length	0.715m 28")
weight	4.025kg (8.86 lbs)
magazine capacity	5 rounds

The one-piece, pistol grip stock ends halfway up the barrel. The barrel is surrounded by a tubular wooden handguard between the lower and upper bands, which acts as a cooling jacket, with lateral ventilation grooves plus a large opening on top.

The barrel is bored to 7mm with four grooves to the right with a 220mm (8.66") twist. When fired, the barrel recoils and compresses two recoil springs placed

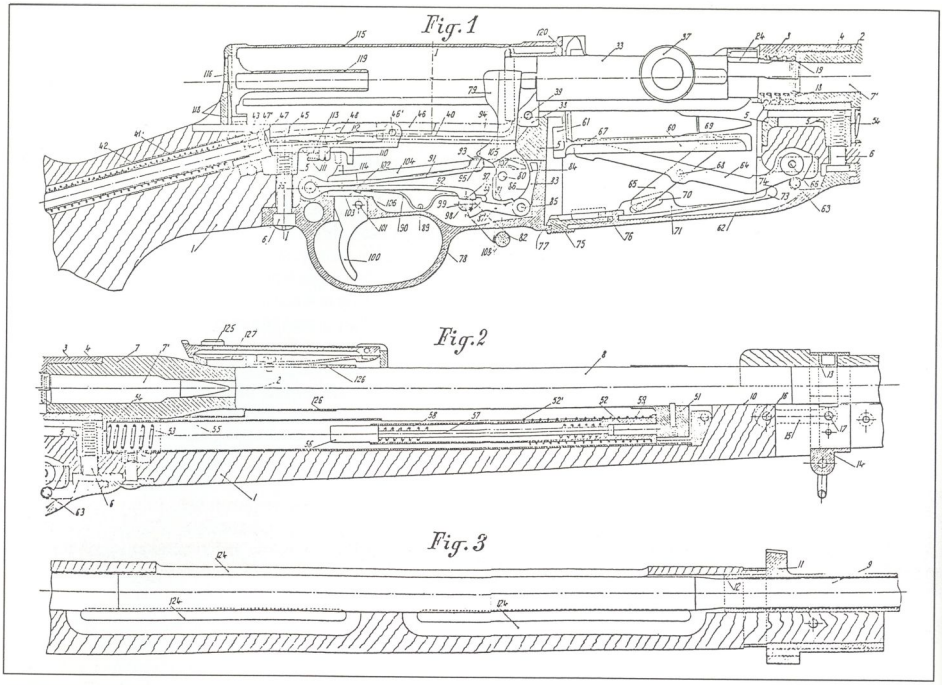


Fig. 1
Fig. 2
Fig. 3

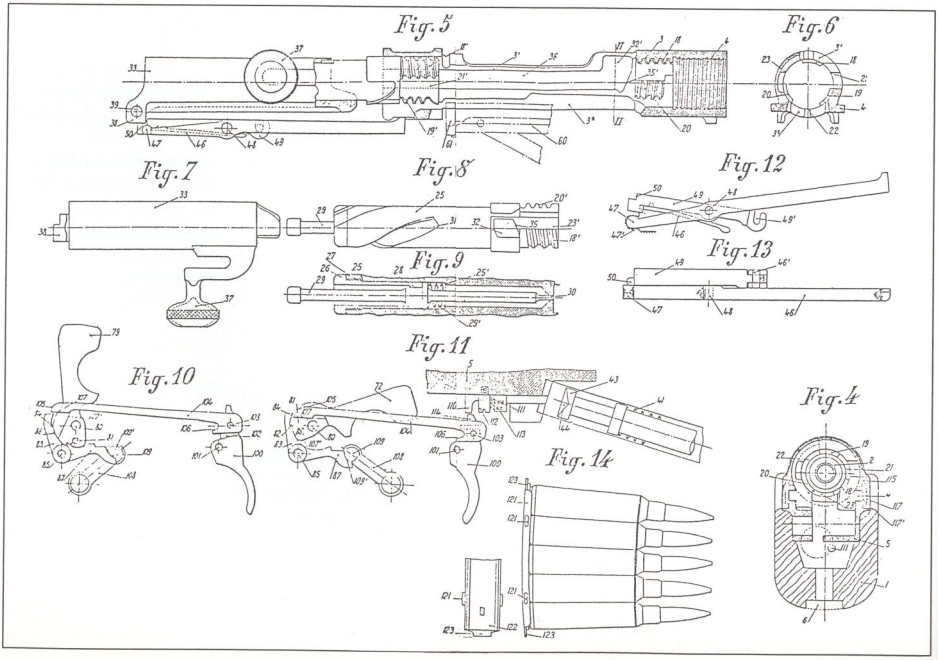
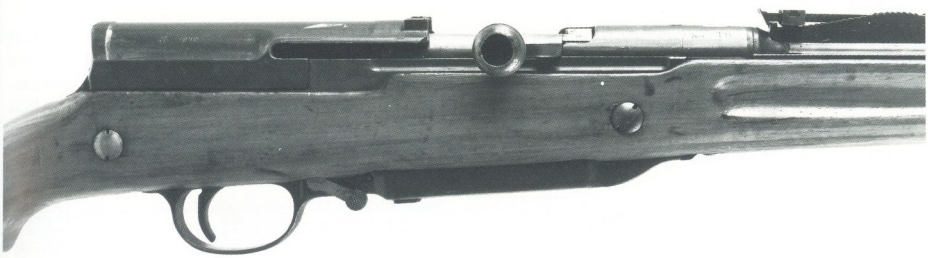
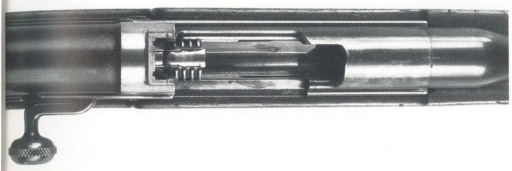


Fig. 5
Fig. 6
Fig. 7
Fig. 8
Fig. 12
Fig. 9
Fig. 13
Fig. 11
Fig. 10
Fig. 4
Fig. 14



42 (previous page). Figures from Etienne Meunier's patent No 502,478, dated October 4, 1915, showing various features of the long-recoil A6. Like the NL rifle, the Meunier A6 appears to be yet another direct takeoff of the 1900 Browning patent.
Note the front-locking, helical bolt and (below) the special stripper clip holding 5 rounds of 7mm Meunier ammunition.
courtesy INPI

43 (above). Right side closeup of the long recoil A6 Meunier rifle, with bolt closed. The A6 proved more difficult to manufacture than the M1917 rifle; requiring very closely toleranced machining.



44. Top closeup of the 7mm A6 rifle, showing bolt open.
Note the front-locking, interrupted-thread type lugs on the bolt head.

45. Right side closeup of the muzzle area showing the barrel guide/front sight housing. The barrel was free to recoil within its guide even with the bayonet fixed to the housing.

in a tube underneath and towards its rear. This tube also houses a recoil damper spring.

The receiver is made up of a housing and a cover. There is a large feeding slot and a groove for the cocking lever. The moving parts are the bolt carrier, which carries the cocking handle, and the rotating bolt with its three series of interrupted-thread lugs. The recoil spring is in the stock, and is connected to the moving parts by the operating rod.

The trigger housing is an independent assembly which holds all the parts of the trigger mechanism. To fire, an internal hammer, powered by a flat mainspring, strikes the firing pin. The rifle has a safety device.

Feeding is done by a throwaway 5-round stripper clip, the cartridges lying staggered in the magazine, which is part of the receiver housing. The magazine has a pantograph-type follower with an 'X' crosspiece pushed by a leaf spring with a roller. Ten- and fifteen-round magazines were also studied but not retained.

The rear sight slide and steps are marked from 300 to 2,300m. The leaf also has a position marked 'C' which corresponds to combat shooting at short distances. The front sight is placed on the long endcap which serves as a forward guide to the barrel.

The main metal parts of the rifle are completely built of machined steel, blued except for the bolt and buttplate which are polished.

The left side of the receiver is marked

M^{IER} A6 M^{LE} 1916 *Tulle.*

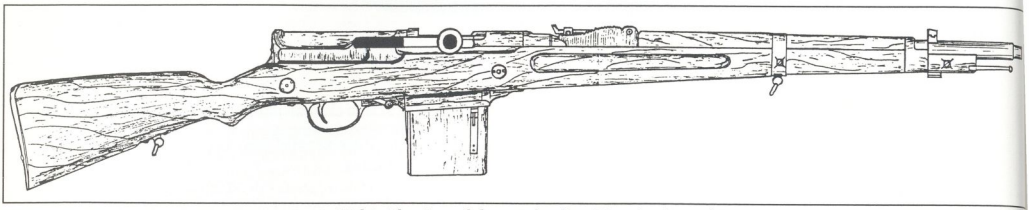
A sword-bayonet, derived from the M1892 Musket could be attached to the A6 rifle. The straight blade with one cutting edge and groove measures 0.40m (16"). The crosspiece does not have a quillon but has a barrel ring. The metallic pommel handle has two riveted grips. The scabbard is in blued sheet metal.

The Meunier Model 1916 rifle was supplied with a waterproof cloth cover which was closed by belts and pressure buttons. The cover was used when transporting the rifle, and served to protect the mechanism against the introduction of foreign material.

Operation of the M1916

When fired, the barrel recoils, carrying with it the bolt assembly. Through the helical cam groove in the bolt carrier, the bolt head is rotated and unlocked. The barrel stops its rearward travel, allowing the bolt assembly to continue rearward, extracting and ejecting the empty case. The barrel returns to its place while the bolt assembly compresses the hammer spring and cocks the hammer. It then goes forward, introducing a new cartridge into the chamber. After the last round, the bolt catch retains the bolt assembly in the rear position.

The Most Advanced Rifle in the World: the Meunier A6 Carbine



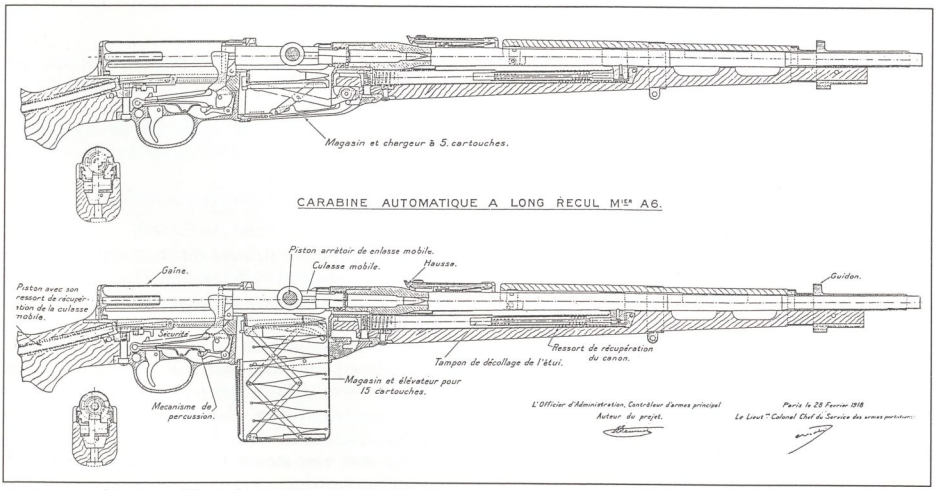
46. Right side view of the autoloading Meunier A6 carbine with a fifteen-round magazine, arguably the most advanced rifle in the world at the end of World War I.
drawing by the author

In 1916 Etienne Meunier also developed a shortened version of his A6 rifle, in two models: one for cavalry and infantry, and another without bayonet lug or handguard for aircraft use.

Both weapons were proposed with five or fifteen cartridge magazines. A magazine of 10 rounds was also tried out. Considerable testing was done on these weapons until the end of the war. In comparative trials, it came out well placed due to its performance.

Characteristics, A6 Meunier Carbine

action	long barrel recoil
calibre	7x56.95mm Meunier E 7
total length (land model)	1.096m (43")
total length w/bayonet	1.482m (58.3")
total length (air model)	1.077m (42.4")



47. Cutaway drawings of the 5-shot A6 Meunier rifle (above) and the 15-shot A6 carbine, below. Dated February 28, 1918, this document was one secured by the British delegation led by Lord Cottlesloe, which went to France in September, 1918 to examine French solutions to the problems of autoloading rifle design. courtesy MoD Pattern Room,Nottingham

barrel length . . . . . 0.570m (22.4")
wt w/5-round magazine . 4.5kg (9.9 lbs)
wt w/15-round magazine 5.73kg (12.6 lbs)
magazine capacity . . 5, 10 or 15 rounds

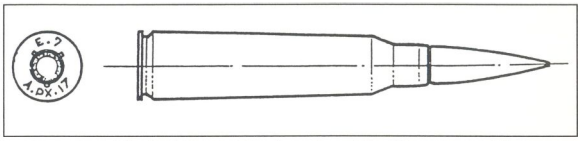
The aviation carbine weighs 600g less than the one designed for land forces. Both barrels are of the same length and provide a muzzle velocity of 810m/s (2,657 fps).

The autoloading Meunier A6 carbine equipped with a fifteen-round magazine was arguably the most advanced rifle in the world at the end of World War I.

7mm Meunier Ammunition

A great number of cartridge designs were tested during the development of the Meunier rifle. All were modern rimless bottlenecks with very little case taper. Testing began in 6.5 and 7mm calibres, using cases from 56 to 59mm long, and experimenting with shoulder angles between 35 to 80°. The 56.95mm E7 case with a 50° shoulder was finally adopted for the A6 rifle.

Several bullets were also tested, and finally a pointed bullet, Type 307, designed on August 11, 1916, 37mm (1.46") long and weighing 9g (139 gr) with a brass jacket and a steel core, was adopted. Loaded with 3.13g of BN3F or BN3F Improved powder, the muzzle velocity of the Type 307 bullet exceeded 850m/s (2,789 fps).



48. The final (7x56.95mm) version of the Meunier cartridge, first issued in 1916 to support the A6 Meunier rifle.

The 7mm Meunier was way ahead of its time—a remarkably potent round with ballistics akin to the 7mm Remington Express (introduced in 1957).

Note the headstamp 'APX' (Puteaux): all of the Meunier cartridges were manufactured at Puteaux Arsenal.

actual-size drawing by J Barlerin

Evaluation of the Meunier System

Production of the A6 Meunier ended on August 13, 1917, with a total of 1,013 M1916 rifles made, of which 843 were sent to the front lines.

The M1916 gave generally good results, although in spite of the qualities of the Meunier system, the rifles were faulted for being too complex, for not being able to be worked manually in the case of a broken part, and above all, because they used special ammu..ition. The main specific negative points were that it was too long for trench warfare, there were too many stoppages for a military rifle, and it became too hot under sustained fire. However, users of the A6 rifle found that ensuring an adequate supply of the special 7mm Meunier ammunition was more troublesome than the rifle's functioning problems.

The brief issue of the 7mm Meunier, good as it was, made it amply plain that cartridge commonality was a goal to be pursued at almost any cost.

The *Fusil Automatique Modèle* 1917: World's First Issue Autoloading Rifle

As noted, the autoloading 8mm RSC rifle had been adopted in May, 1916 under the designation "Model 1917 [Semi-] Automatic Rifle" (*Fusil Automatique Modèle* 1917), through note No 27001/3 dated December, 1916. However, technical problems had delayed the start of series manufacture, hence the "stopgap" issue of 843 7mm Meunier A6 rifles in 1916.

Production of the M1917 rifle began on April 1, 1917, divided among manufacturers specialised in small arms:

- *Manufacture Nationale d'Armes de Tulle* (MAT) made the receiver, barrel and triggerguard;
- *Manufacture Nationale d'Armes de Châtellerault* (MAC) made the trigger housing;
- *Manufacture Nationale d'Armes de St-Etienne* (MAS) made the bolt, bolt carrier, piston, gas cylinder, stock and also barrels;
- *Manufacture d'Armes de Paris* (a private company, owned by Fabrique Nationale) furnished the cocking lever, the magazine housing and the follower assembly.

These parts were assembled into rifles largely by MAS, with only about one hundred assembled at MAC. (The serial numbers of rifles assembled by MAS have an A prefix; those made by MAC have a B prefix.)

France was therefore the first country in the world to issue to its infantry an autoloading rifle for use at the front. In the units that were equipped with the M1917 rifle, 16 rifles were distributed per company to platoon

49. Right (above) and left (below) views of the *Fusil automatique Modèle* 1917. Presented as a modification of the M1886-1893 Lebel, but in reality very few Lebel parts were used.

Like other rifles of its generation, the 8mm Lebel calibre M1917 was perforce dimensioned according to the antiquated specifications laid down by the General Staff, and was thus far too long.

leaders and to good marksmen, chosen by their aptitude to use autoloading weapons and to carry out the frequent mechanical repairs they required.

Description of the M1917 Rifle

Characteristics, Model 1917 Rifle

action	gas impingement
calibre	8x50R Lebel
total length	1.330m (52")
length with bayonet	1.848m (72¾")
barrel length	0.580m (22.8")
weight	5.225kg (11.5 lbs)
magazine capacity	5 rounds

It is not easy to describe the 1917 rifle, because during its production, it received a number of modifications. The additions to the User's Manual are numerous.

The stock is that of the Model 1886-1893 Lebel; it is fixed by two metal screws going through the wood vertically, from the bottom to the top, uniting the trigger housing and the rear of the receiver. The forward screw is held by a transverse nut.

The trigger housing is relatively simple. It contains the triggerguard and the trigger mounted on the trigger pin. The striker is placed on a cover in front of the housing. One steel coil spring serves both the trigger and the hammer.

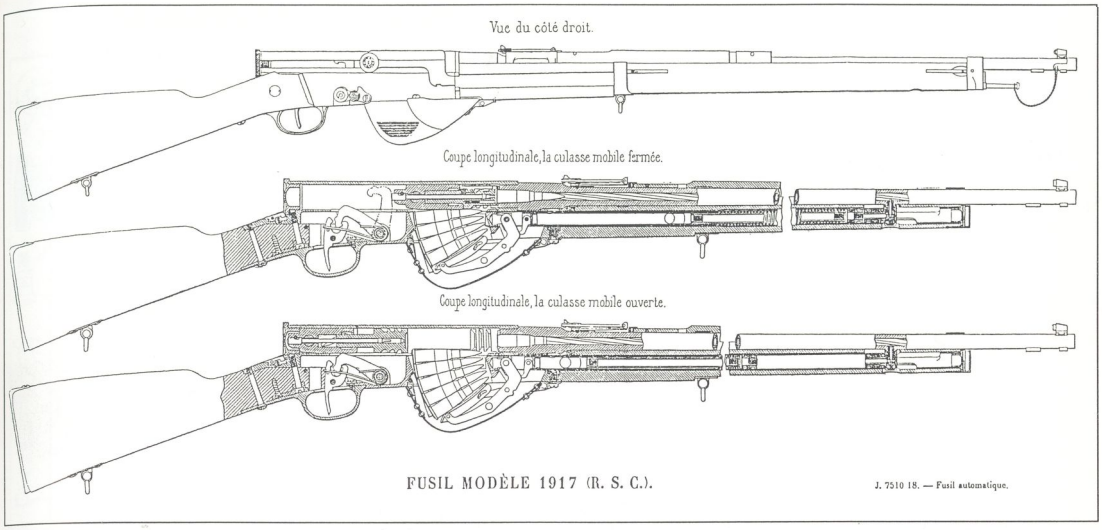
The upper part of the receiver is tubular, the lower part is square. The rear end of the tubular receiver is closed by a serrated plug, held by a retaining lever and spring. The bolt locking slots are machined internally in the forward part of the tubular section. The right side has the bolt catch which allows the bolt assembly to be locked in the rear position by latching onto the heel of the operating rod. This device, quite primitive on the first rifles produced, was later modified.

The safety lever is on the left side. Pushed forward (S) it blocks the hammer for safety. Pushed rearwards (F) it allows firing.

The left side of the receiver is marked "Manufactures Nationales/MA S 1918 Mle. 1917".

The cylindrical bolt is made up of two parts: the bolt carrier (fig 51 no 66), to which is fixed the operating rod, and the bolt (fig 51 no 58), which on its front has two opposing series of three lugs each and at the rear, two lugs which slide in the two helical channels of the bolt carrier, to ensure the rotation of the bolt. Within the bolt are the extractor and the firing pin channel.

As mentioned, the barrel used was from the bolt-action Mannlicher-Berthier M1916 rifle, because Lebel barrels were no longer being made when the Model 1917 started production. It is bored to 8mm and has four grooves with a 240mm right-hand twist (1 turn in 9.5"). The gas port is 140mm (5.5") from the muzzle, and has a regulating screw. The gas cylinder is under the barrel inside the forearm, where the Lebel tubular magazine was. The piston is extended by the operating rod which



50. Plate I from the author's copy of the April 15, 1918 edition of the Instruction Manual for the *Fusil Automatique* M1917.

Top: right side view. Note the muzzle protector, tied to the stacking rod.

Centre: right side cutaway to show gas system and loaded magazine. Bolt locked and firing the chambered cartridge.

Below: bolt and gas piston in rearmost position, fresh *en bloc* clip of five 8x50R cartridges in magazine. The receiver locking recesses for the interrupted-thread type bolt lugs can clearly be seen. Note the magazine follower spring arrangement, which predates that used in the M1 Garand.

slides on the right side of the receiver to the rear of the lower band. The operating rod is extended by a flap which covers the ejection port.

The magazine holds a Mannlicher-type loading clip. The clip is not interchangeable with the one for the bolt-action M1916 because its bottom is flat and does not have a locking device. The feeding mechanism is made up of the follower, two links and one cam. These are pushed upwards by the follower tube plunger. A magazine housing in pressed steel protects the loading clip. This housing is hinged at the front, and opens downward from the rear. Its closing is ensured by a small flat spring riveted to the rear.

The sights are also from the Model 1916 rifle. The triangular front sight is placed on a base. The rear sight is mounted on an annular ring, soldered to the barrel close to the breech. Folded down, the sight is designed to shoot correctly at 250m. Adjustment of the rear sight slide is made in 100m increments in steps from 400 to 800m, and by raising the leaf, from 900 to 2,400m. Certain rifles were equiped with phosphorescent capsules on the front sight and the V notch for use at night.

The front part of the rifle is made up of the forestock, held in place by a lower band with a ring for the sling, and by an upper band with a straight stacking rod. The handguard covers the barrel from the front part of the rear sight to beyond the lower band.

Operation

Place the rifle on its side, open the magazine housing by pulling down on the rear.

Pull the follower down until the feeding system locks; the cam engages the principal link.

Introduce a fully loaded clip, close and latch the magazine.

Place the safety lever in firing position (F).

Pull the cocking lever all the way back and let go. The hammer will be cocked, a cartridge will be introduced into the chamber, and the bolt will close and lock.

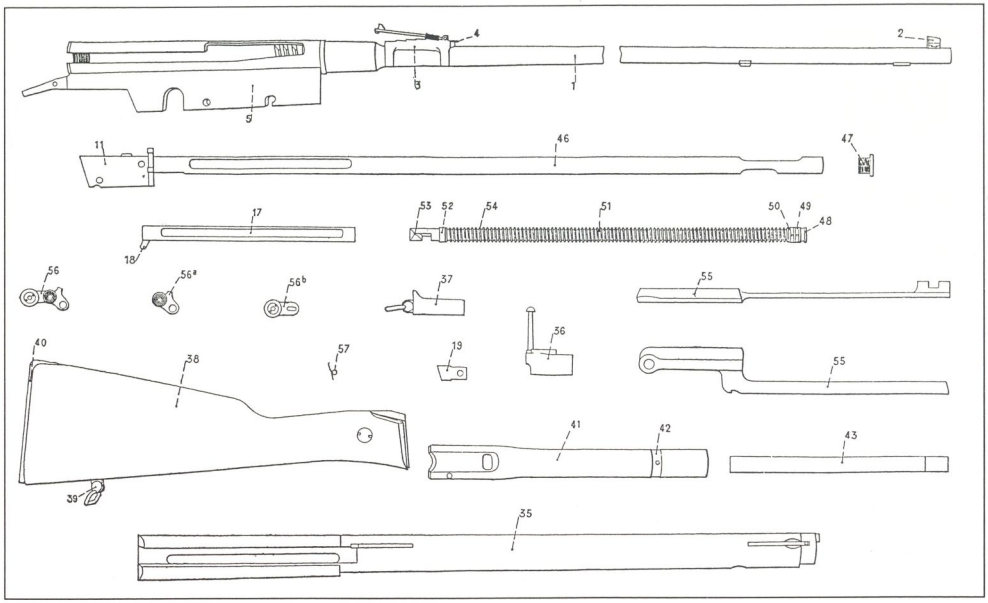
Adjust the rear sight to the distance to the target.

The rifle is ready to fire.

Functioning

As the shooter presses the trigger, the sear disengages. Due to the pressure of the spring, the hammer hits the firing pin; the rifle fires.

When the bullet passes the gas port, part of the gas enters the cylinder, pushing the piston rearward to



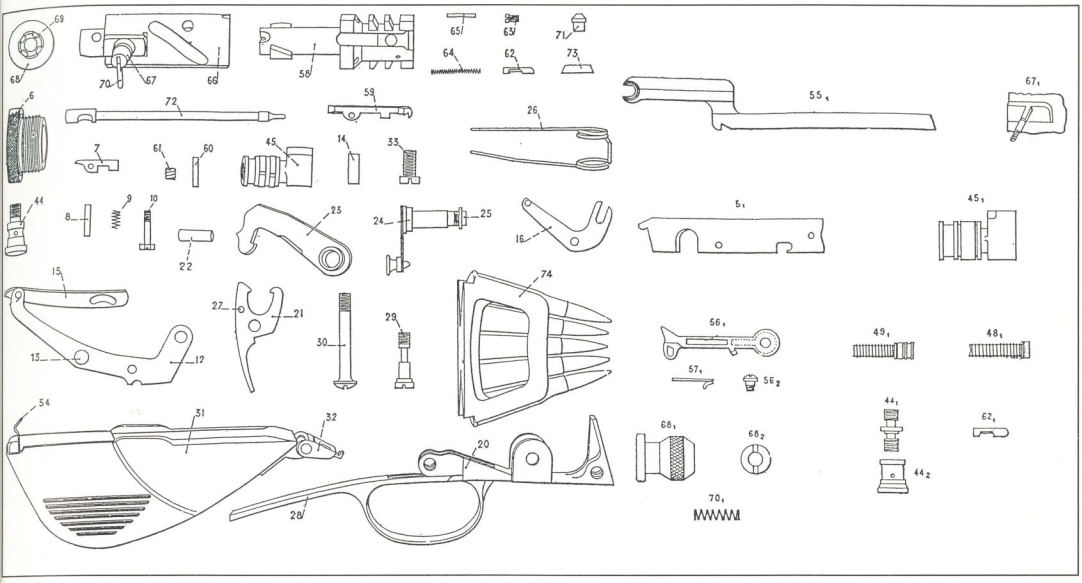
51 (above and facing page). The M1917, disassembled.

Above: Plate II from the author's copy of the M1917 Rifle Instruction Manual of April 15, 1918 showing the main components.

Facing page: Plates III and IV combined, showing other components, plus a continuation of the parts names given in the Manual, translated below.

Components, *Fusil Automatique Modèle* 1917

1. Barrel
2. Front sight
3. Rear sight
4. Rear handguard retainer
5. Receiver
6. Receiver plug
7. Receiver plug latch
8. Receiver plug latch pin
9. Receiver plug latch spring
10. Receiver screw
11. Feeding mechanism support
12. Follower lever
13. Follower lever arm
14. Follower axis pin
15. Follower
16. Follower guide
17. Follower tube plunger
18. Follower plunger
19. Cartridge guide plug
20. Trigger housing
21. Trigger
22. Trigger pin
23. Hammer
24. Safety lever
25. Safety lever nut
26. Hammer and trigger spring
27. Hammer and trigger spring pin
28. Triggerguard
29. Take down screw
30. Triggerguard rear screw
31. Magazine housing
32. Magazine housing hinge
33. Magazine hinge screw
34. Magazine housing latch spring
35. Forestock
36. Upper band and stacking rod
37. Lower band
38. Buttstock
39. Rear sling swivel
40. Buttplate
41. Rear handguard
42. Handguard retainer, front
43. Operating rod housing
44. Gas regulating screw
45. Gas coupling
46. Gas cylinder
47. Gas cylinder plug
48. Gas piston nut
49. Gas piston rings
50. Gas piston head
51. Gas piston
52. Gas piston spring retainer
53. Hooking sprocket
54. Return spring
55. Operating rod (2 pcs)
56. Bolt stop assembly



51 (continued from facing page).

56a. Bolt stop
56b. Bolt stop lever
57. Bolt stop lever spring
58. Bolt
59. Extractor
60. Extractor pin
61. Extractor spring
62. Ejector
63. Ejector screw
64. Ejector spring
65. Ejector spring guide
66. Bolt carrier
67. Cocking rod
68. Cocking handle
69. Cocking handle jacket
70. Cocking handle clamp
71. Bolt stop pin
72. Firing pin
73. Firing pin stop
74. Stripper clip

compress the recoil spring and push the cocking lever backwards.

As the bolt rotates 90° following the cam in the bolt carrier, the locking lugs on the bolt head disengage from the receiver. The mobile parts recoil, and extract the empty case.

As the bolt recoils, the upper hammer hook is forced into the disconnecting sear. The disconnecting sear holds the hammer while the case is ejected. When the shooter finally releases the trigger, the disconnecting sear transfers the cocked hammer to the trigger sear. (In later years this system was to be used on the MAS 49 (and also on the M16 rifle), almost without alteration.)

Under the combined action of the cam and links, the follower pushes the ammunition upwards and presents the upper cartridge.

At the end of the recoil stroke the recoil spring pushes the mobile parts (piston, cocking handle, bolt) forward. A new cartridge is introduced into the chamber and the bolt closes, rotating and locking the bolt head to end the forward movement.

Disassembly

This operation requires a screwdriver.

Make sure the rifle is unloaded, then pull back on the cocking piece to cock the hammer.

Withdraw the handguards; withdraw the cocking handle button; withdraw the operating rod.

Unscrew the receiver cap, and withdraw the bolt assembly; separate the bolt from the bolt carrier.

In French service, further disassembly (the trigger mechanism, the feeding system and the gas system) was left exclusively to the unit armourer.

52. The magazine of the M1917 rifle, shown opened for loading with an *en bloc* clip of 5 rounds of 8mm Lebel ammunition.

Accessories

a. Individual Issue

Each soldier issued with the M1917 rifle also drew the following individual accessories:

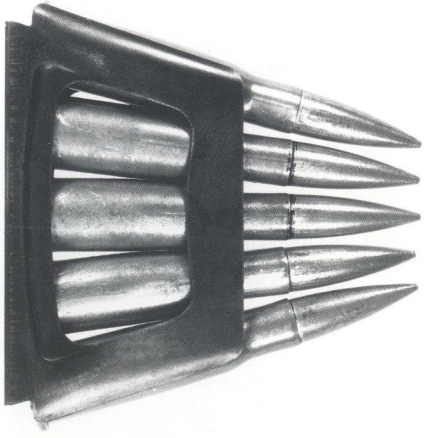
- waterproof cloth case to cover the mechanism.
- muzzle cover.
- bayonet (the M1886/93/15 sword bayonet). It measures 635mm (25") overall, the blade is 518mm (20.4"). The handle is in brass, cupronickel or blued steel. The steel crossguard supports the ring and the unlocking button. It does not have an extended crossguard. The cruciform blade is made of polished steel. The truncated cone scabbard is made of blued sheet steel, ending in a ball.
- cleaning kit bag. It holds an oil can, a hook/ejector/screwdriver, a pin punch, a brush, a wooden cleaning pick, a pullthrough and a rag. It was planned to provide one third of a cleaning rod to each man.

b. Tools and Spares

Each company was given a special kit containing the necessary tools to ensure complete disassembly of the rifle, as well as a lot of spare parts (ejectors, extractors, firing pins, screws, pins, springs) allowing the armourer to repair rifles in the front line.

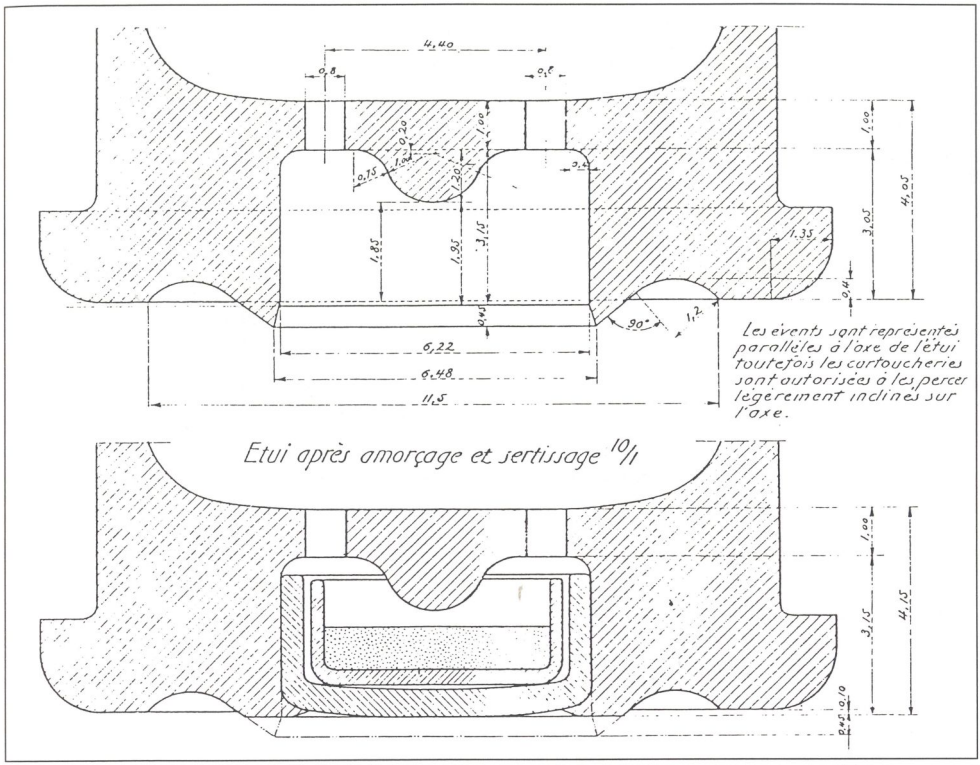
The author has found no trace of evidence that a telescopic sight was ever used with the Model 1917 rifle.

A receiver dust cover in sheet steel presented by Lt Rémy of the 172 Infantry Regiment was tested in February, 1918 but it did not perform as well as expected.



53. The 5-round *en bloc* charger clip for the 8x50R M1917 rifle, unfortunately not interchangeable with the clip issued for the M1916 bolt-action rifle and musket.

Ammunition: the 8x50R M1886 D (a m) Cartridge



54. Two closeup cross-sections of the base of the 8x50R M1886 D (a m) cartridge. The letter 'D' denotes the solid-brass *balle* D bullet; the letters 'a m' stand for *amorçage modifié*, or modified primer.

Above: unprimed M1886 D (a m) case, formed with a proud "lip" around the primer pocket. Note the two flash holes for the Berdan primer system, with the case itself forming the anvil in the centre of the pocket.

Below: primed M1886 D (a m) case, with lip ring-crimped around the circumference of the primer cover. The 8x50R D (a m) cartridge was developed to prevent "popped" primers in automatic and autoloading mechanisms, and became the standard round for use in French automatic weapons during World War I. courtesy Dr Philippe Regenstreif

The Model 1917 rifle fires the 8x50R Lebel cartridge, the load most commonly used being the *Cartouche Modèle 1886 D (a m)*, the standard round for French automatic weapons during World War I.

The 'a m' stood for *amorçage modifié* (modified primer). It had been found that primers had to be crimped in around the circumference of the primer pocket in order to prevent their popping out on automatic fire, and jamming the sensitive front-locking, turnbolt mechanisms then favoured.

The M1917 used a special flat-based loading clip, not interchangeable with the one used for the 1916 bolt-action rifle or musket, which held five 8mm cartridges. Packages were provided containing two full loading clips each.

Each man carried 120 cartridges (24 loading clips or 12 packages). Cartridge pouches could receive either eight loading clips placed head to tail or three packages of two clips each. Ammunition which could not be stored in the pouches was carried in the greatcoat pockets.

Evaluation of the M1917 Rifle

Series production of the M1917 began in April, 1917 and continued for seventeen months. By September 30, 1918, 85,333 units had been manufactured, at a rate of up to 5,500 per month. Production could have been increased, but the faults of the M1917 were quickly discovered and the rifle was relegated to "transitional" status, awaiting the appearance of some other design.

Concerning the functioning of the M1917 RSC rifle, it must be admitted that it was really less satisfactory than that of the "stopgap" Meunier A6, which had the design advantage of a slimmer, rimless cartridge (when those special cartridges were available!).

In addition, the excessive weight of 5.2kg (11.5 lbs) and the extreme length of the M1917 were incompatible with combat methods which necessarily relied on the terrain's profile for stealth.

Making It Work: Dealing with Stoppages in the Field

The principal stoppages of the M1917 rifle were due to:

- foreign material entering the large, open cocking handle/operating rod slot/ejection port on the right side of the receiver, fouling the delicate mechanism;
- the cartridge case, which was designed for tube-magazines and proved problematic when fed from a vertical box magazine;
- the poor design of the loading clip, which was fragile and difficult to use;
- breakages of certain parts, notably the bolt and piston, which could be caused by too violent a blow of gas (in early-numbered guns).

In all, the adjustment of the M1917 rifle was quite delicate. A gas regulating screw was eventually added to reduce the incidence of parts damage due to gas overpressure, but this led to complaints of gas energy insufficient to cycle the action.

The Operator's Manual for the M1917 Rifle contained a long list of potential stoppages and the immediate action required in each case. Some of the most common:

Problem	Cause
difficulty in introducing a cartridge	defective loading clip
bad presentation of a cartridge to the bolt face	defective loading clip
no feed	could be due to many reasons: insufficient recoil, fouling, defective loading clip.
no ejection	weak extractor spring
insufficient recoil	maladjustment of the gas regulating screw, fouled weapon, or faulty mechanism.

The above enumeration is far from exhaustive, but it does show that many minor faults *could* be remedied, right in the front lines.

Chopping it Down: the M1917 Short Rifle

55. Right side view of the 8mm M1917 short rifle, the forerunner of the improved *Modèle* 1918, discussed below.

The only differences between the M1917 short rifle and the regular M1917 were the shorter barrel, a larger upper band, and a pointed and curved stacking rod. The rear sight was the same.

This model was experimentally manufactured in small quantities. Some were perhaps tested at the front.

Coming to Grips: the Model 1917 Musket

56. The *Modèle* 1917 *Mousqueton* (Musket). The barrel has been shortened beyond the end of the gas tube, and covered with slotted wooden handguards. Overall length: .993m (39"); barrel length .45m (17.7"); weight: 4.650kg (10¼ lbs).

An even shorter experimental assault weapon was developed from the short rifle Model 1917. Its barrel, which measures only 45cm (17.7") is fitted at the muzzle with a single-slot compensator.

The front of the gas cylinder can be disassembled. It is slightly longer than the barrel and seems to be made to receive a tubular bayonet. Two symmetrical handguards surround the barrel. Magazine capacity remains five rounds, loaded by means of the special M1917 *en bloc* charger clip.

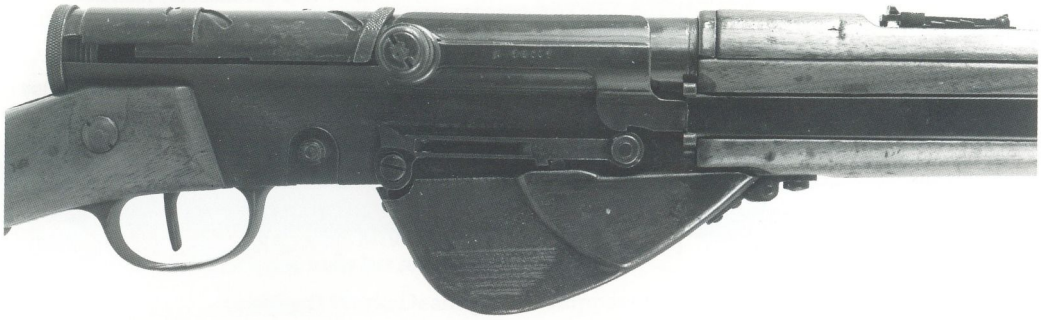
The Improved M1918 Autoloading Rifle—Just in Time for the Armistice

57. Right side view of the improved *Modèle* 1918 autoloading rifle. Manufacture began in November, 1918 and was limited to 4,000 units.

The 8mm M1918 rifle was a very smooth gun which unfortunately arrived too late. It was later used in Morocco during the Rif war of 1921-1926, where it gave "complete satisfaction".

Tests of the shortened M1917 autoloading rifle indicated that, within the limitations of the M1917 design itself, the shorter barrel was desirable. It was therefore decided to remedy some more of the basic faults of the M1917before switching to the manufacture of a shorter model. The resulting M1918 rifle embodied the following improvements over the M1917:

- recoiling parts equipped with a rotating dust cover which closes over the receiver, thus sealing the cocking handle slot to the ingress of foreign matter.
- operating system modified to incorporate a telescopic recoil spring.
- handguard now surrounds the rear sight, covering the barrel for the same length as the forend.
- the rear sight is shorter, and is graduated only to 2,000m.
- a bolt catch holds the mobile parts to the rear after the last cartridge is fired.
- capable of using the same 5-shot loading clip as the Model 1916 (bolt-action) rifle, thus simplifying the ammunition supply considerably.



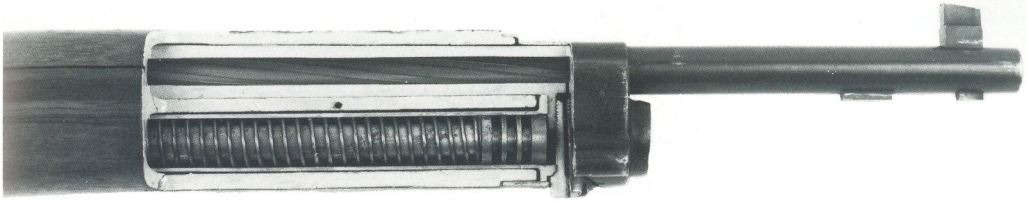
58. Right side closeup of the M1918 receiver. Note the rotating, stamped metal cover that seals the cocking handle slot when the action is forward.

59. Right (top) and left (bottom) side closeups of a cutaway *Modèle* 1918, with bolt forward and hammer down.

Above: details of trigger mechanism and magazine, shown loaded with a full 5-round charger clip.

Below: details of markings and safety catch. Receiver cutaway to show bolt head unlocking slot in bolt body.

Note the overstamped '8' in the designation "M^{LE} 1918": this cutaway training rifle was converted from (or made up on) an M1917 receiver.



60. Right side closeup of the muzzle area of the cutaway M1918 rifle featured on the facing page.

The gas cylinder takes the place of the tubular magazine in the original M1886-1893 Lebel.

- the magazine housing latch was modified (the one on the 1917 had a tendency to open during firing).

Testing of the Model 1918 rifle started in the summer of 1918. Its manufacture did not start until November of that year, and was limited to 4,000 units because by then the war was over. Nevertheless, this model remained on priority stand-by for manufacture in case a crisis arose during the uncertain period which followed Germany's capitulation.

The postwar development of more modern weapons soon made the 8mm M1918 rifle obsolete, but it was battle-tested in Morocco during the Rif war of 1921-1926, where it gave complete satisfaction.

Characteristics, Model 1918 Rifle

action	gas impingement
calibre	8mm Lebel
total length	1.100m (43.3")
length with bayonet	1.628m (64")
barrel length	0.580m (22.8")
weight	4.770kg (10.5 lbs)
magazine capacity	5 rounds

61. The M1918 rifle used the same charger clip as other five-shot 8mm arms then in French service (the M1916 Mannlicher-Berthier rifle and musket).

An Interwar Proposal: the M1918 Rifle Fitted with the "D Motor" Recoil Compensator

Some years after the war a proposal to modernise the Model 1918 rifle was presented under the name "D Motor" by the Belgian gunsmith Joseph Destrée, whereby the gas system was modified and a device manufactured by the Francotte company of Liège, Belgium was installed.

According to the inventor, the "D Motor" worked by "establishing a counter-pressure against the opening of gas operated firearms so as to regularise and soften their operation". Monsieur Destrée cloaked the actual workings of his device in great secrecy, only allowing the testers to fire and superficially examine the weapons after they had been modified.

The device was tested several times at the Technical Institute of Versailles (CTV) from 1927 to 1931, but it was not retained.

The Interwar Model 1917/35 and 1918/35 Rifles

In 1935, M1917 and M1918 autoloaders were converted into manually-operated repeaters for issue to reserve troops. This was done by inserting a steel rod into the gas vent hole, blocked in turn by the gas regulating sleeve.

It seems that some Model 1918 rifles escaped this modification, as their use as autoloaders is mentioned by the *Gendarmerie Mobile* and Commandos during the 1939-1940 campaign, as well as in Indochina.

Other Experimental Rifles of World War I

Throughout World War I the French Army tested a number of other autoloading rifles. In this area the French showed themselves more inventive than their Allies: a British Commission headed by Lord Cottlesloe came to France in July, 1918 to examine the available designs, to see which systems would provide possible solutions to their own problems. As noted, one of the Commission's finds included the cutaway drawings of the A6 Meunier rifle and carbine (fig 47).

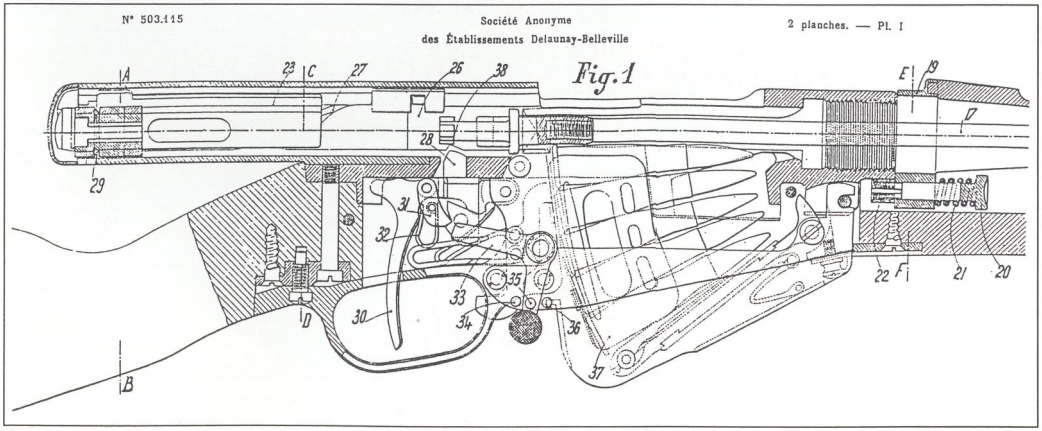
The Delaunay-Belleville Auto Rifle "Kit"

62. The Delaunay-Belleville automatic rifle, actually a transformation of the 8mm *Modèle* 1916 bolt-action rifle.
photo courtesy CAA

Although the Delaunay-Belleville company manufactured automobiles, it participated in the war effort by manufacturing rifles and muskets. It also made an interesting "kit" whereby the bolt-action M1916 Mannlicher-Berthier was transformed into an automatic rifle.

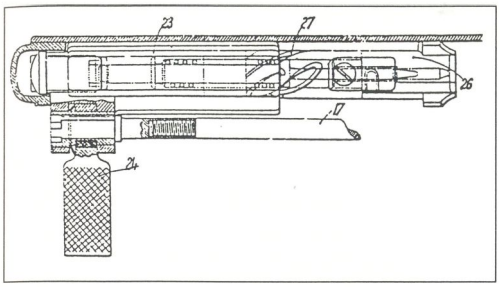
A patent was requested for this rifle on December 1, 1916 under number 503,115, which was delivered on March 9, 1920. The system works by gas impingement with a piston acting on a rotating bolt. The rifle has a selector which allowed it to fire single rounds or a burst.

Presented by Captain Bourdelles to a Commission presided over by Colonel Bernard, the hybrid rifle was tested on November 30, 1916 in the Army Field at Satory. It worked very well, but the recorders noted the violent recoil of the 8mm Lebel ammunition during burst fire.



63. Fig 1 from patent No 503,115: a right side cutaway of the receiver area of the Delaunay-Belleville conversion of the M1916 8mm Lebel calibre bolt-action rifle, showing the bolt retracted and a full 5-round charger clip in the magazine.

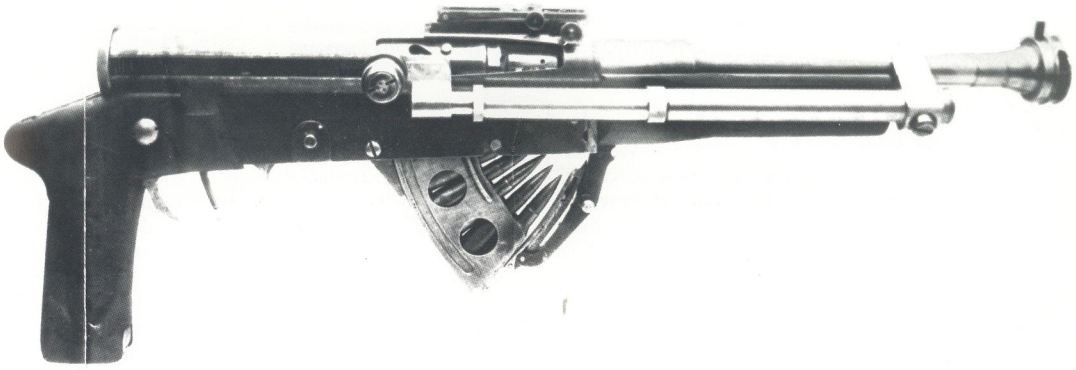
Like the A6 Meunier, the Delaunay-Belleville design was heavily dependant on flat springs. courtesy INPI



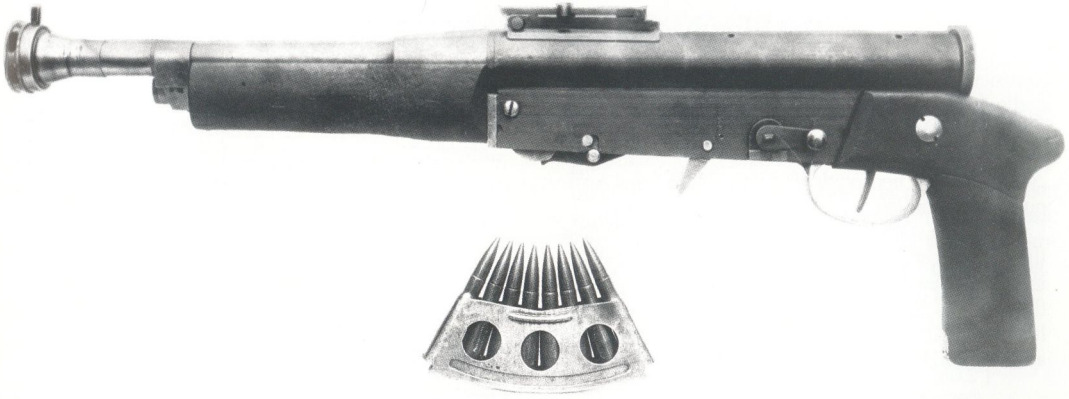
64 (left). Fig 9 from patent No 503,115: the twin-lugged, front-locking bolt assembly of the Delaunay-Belleville rifle, shown retracted. courtesy INPI

An improved version of the Delaunay-Belleville rifle, fitted with a semi-circular 15-round magazine, was presented in July, 1918, but the performance obtained was not up to the requirements of the military.

The World's First Firing Port Weapon: the Ribeyrolles Machine Pistol

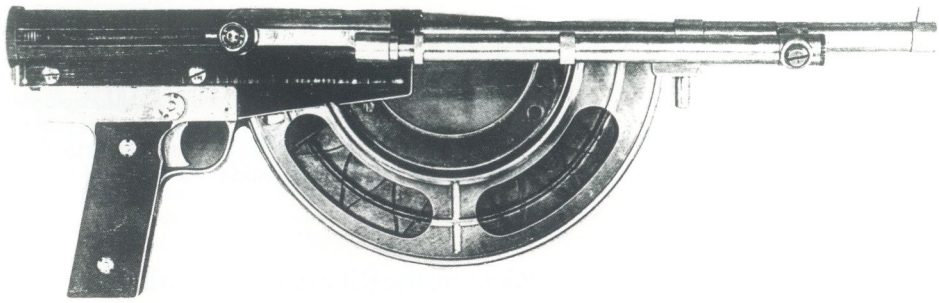


65. Right side view of the Ribeyrolles Machine Pistol, designed for use as a firing port weapon—the world's first—in the Renault FT 17 tank. Calibre 8mm Lebel, capacity: 8 rounds.



66. Left side view of the Ribeyrolles machine Pistol, showing the 8-round charger clip used with this weapon.

Note the enlarged muzzle brake, designed to mate with a ball mount installed in front of the driver in the Renault FT 17 tank.



67. Right side view of the improved version of the Ribeyrolles Machine Pistol, which fed through the 20-round magazine of the Chauchat Machine Rifle.

This perhaps deliberately misleading name was used in 1918 to designate the world's first Firing Port Weapon: a stockless, stripped-down and drastically shortened Model 1917 rifle, made for use in conjunction with a ball mount fitted with a sighting scope, which was to be installed in the front of the driver in the Renault FT 17 tank.

The Ribeyrolles machine pistol had a very short barrel, ending in an imposing muzzle brake. The stock was replaced by a wood pistol grip. The shortened gas cylinder was on the right side. Feeding was by means of a special Mannlicher-type *en bloc* charging clip holding eight rounds of 8mm Lebel ammunition. The rear sight seems to have been taken from a 1903 Springfield rifle. Its total weight was 3.340kg. This first autoloading model was presented in 1918, but it was defective.

Testing continued in 1919 with an improved model, fed with a twenty-round magazine from the Chauchat machine rifle. This model could fire in bursts. Although it functioned satisfactorily, it was too powerful for its intended use.

Characteristics, Ribeyrolles Machine Pistol 1918

calibre	8mm Lebel
total length	0.575m (22.6")
barrel length	0.340m (13.4")
weight	4kg (8.8 lbs)
magazine capacity	20 rounds

The Blowback Ribeyrolles Automatic Carbine

Monsieur Ribeyrolles also designed a true light automatic carbine—a forerunner of the modern assault rifle. It had a selector and a bipod, and was blowback operated. It used an intermediate cartridge obtained from the .351 WSL case, necked down for the 8mm Lebel Armour Piercing bullet.

Testing started in July, 1918 in Versailles, when the rifle was still only a prototype. Trials started again in July-August, 1921 at the Châlons Army Camp, where the arm was still judged to be not perfectly developed. It was also found that at ranges over 400 meters the ammunition lost its efficiency.

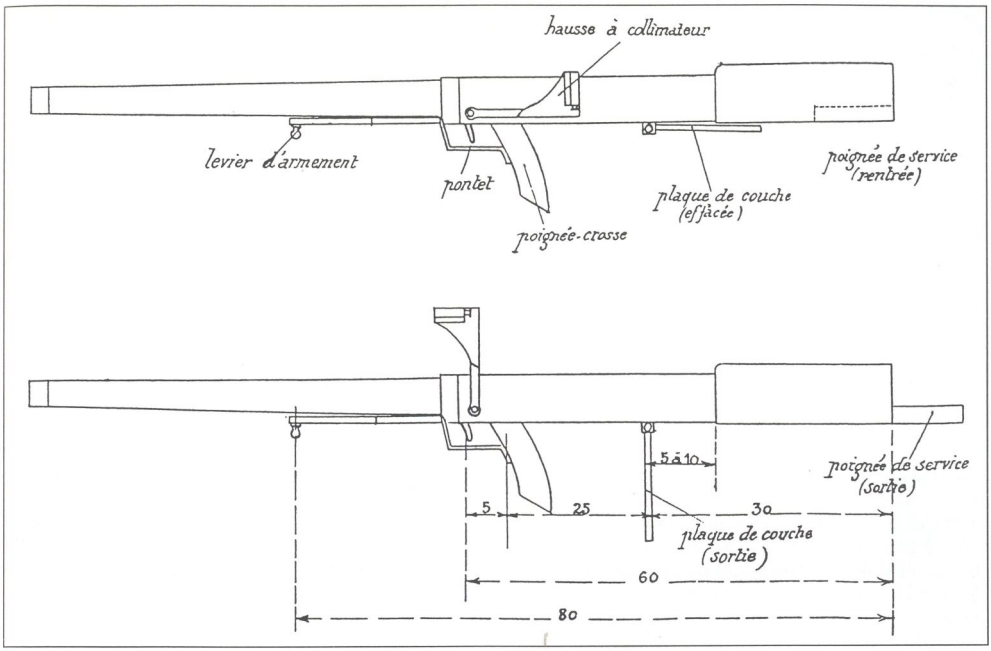
Too advanced for the tactical doctrine of the time, the Ribeyrolles automatic carbine did not interest the military. They found it was excessively heavy for an individual weapon, and insufficiently effective for a collective weapon.

Characteristics, Ribeyrolles Rifle

calibre	8x35mm SR
total length	1.090m (42.9")
barrel length	0.450m (17.7")
weight	5.100kg (11.24 lbs)
magazine capacity	25 rounds

The Faucon Rifle

Lt Col Armand Faucon of the Colonial Infantry was interested in the development of automatic weapons well before the war. He developed a "balanced rifle" concept which, when applied to an automatic weapon,



68. Diagrammatic representation of the theory of the Faucon rifle. Not a rifle *per se*, but an attempt by its inventor, Lt Col Armand Faucon of the Colonial Infantry, to transform the features of any suitable rifle to make them more ergonomic. Labelled components, from left: cocking handle; triggerguard; pistol grip; collimator rear sight (folded above, raised below); buttplate (folded above, lowered below); rear handgrip (stowed above, extended below). courtesy CAA

made it less bulky. Faucon did not invent any particular automatic rifle himself, but rather, according to the inventor, "a configuration adaptable to any existing weapon and capable of bettering its performance".

Basically, the rifle was changed into a configuration which today we would call a "Bull Pup", by doing away with the stock and locating the pistol grip at the rifle's centre of gravity. The rifle was fired by placing it on the shoulder like a rocket-launcher.

Faucon requested a patent on January 12, 1910 which was awarded on January 13, 1911 under number 422,154. The invention consisted in making a special housing which had an articulated butt plate, a central pistol grip plus a rear handgrip. Sighting was done through a collimator offset on the left side.

Testing was done at the Military Musketry School in 1909 and 1911 with a wooden model of a "Faucon Balanced Rifle". The most one can say after reading the conclusions of the trial is that the officers in charge were not at all enthused by the system.

The inventor persevered and in 1918 manufactured two units following his concepts, utilising an A5 Meunier rifle with a 6-round magazine as a base. These Faucon-Meunier rifles were manufactured in Sèvres, and presented at Versailles on July 5, 1918. They were later tested at Châlons in May and June, 1920.

Tests demonstrated that the rifle was subject to numerous stoppages, probably caused by the modifications to the trigger mechanism. It was proven nevertheless that shooters were less tired after long shooting sessions with the Faucon-Meunier than with conventional rifles. The trials were done in all possible shooting situations, even with the shooter wearing a gas mask. Although the Faucon system had advantages, the commission decided the rifle did not merit further testing.

Characteristics, Faucon-Meunier Rifle

calibre	6.5x61mm
total length	1.036m (40.78")
length with bayonet	1.530m (60.2")
barrel length	0.764m (30")
weight	5.480kg (12 lbs)
magazine capacity	6 rounds

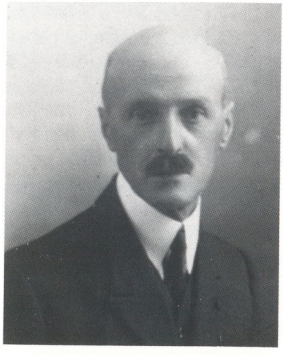
69. A demonstration of the "balanced rifle" concept of Lt Colonel Faucon, using the "Faucon-Meunier" rifle of 1918.

Above, left: with end of rifle resting on the shoulder, a clip of cartridges is stripped into the magazine.

Above: fire-and-movement with the rifle held closer against the shoulder by the (folded-down) buttplate, one arm left free.

Left: with bayonet fixed and the right hand holding the extended rear handgrip, the rifleman is transformed into a pikeman. courtesy MoD Pattern Room, Nottingham

Below, right: Lieutenant Colonel Armand Faucon.
collection Melle Cécile Faucon



Chapter Three

Falling Into Place

The MAS 1918 rifle worked well, but it was handicapped by the shape of its cartridge.

This problem had not escaped notice: the Commander-in-Chief of the French Army, General Pétain, had written to the War Ministry in 1917:

> *. . it is important to state that the present infantry weapons can only be considered as provisional. This is because the shape of the cartridge presently in use prevents normal functioning of automatic weapons. It is therefore necessary to study new models of weapons which could be proposed for adoption as new infantry weapons. If this cannot be done during the war, it will be done after the war*[1] . .

70. A perfect illustration of the feeding problems engendered by the 8mm Lebel cartridge.

Above: the CSRG M1915 machine rifle of World War I. Its "half-moon" magazine holds only 20 rounds of 8mm ammunition in a single row, and is the cause of frequent stoppages.

Below: the excellent *Fusil Mitrailleur Modèle* 1924-29, developed at Châtellerault after the end of World War I. Its vertical magazine holds 25 staggered 7.5mm cartridges.

A New Determination

As a consequence of General Pétain's statement, above, the Ministry of War asked the Directorate of Artillery Matériel to define a new cartridge and propose new infantry weapons.

This organisation produced several reports on these subjects between September, 1918 and February, 1919. Although its members agreed on the need to create a new cartridge, opinion varied on such issues as whether autoloading rifles should be issued to all the troops, or reserved for just the "good shots". Views on these concepts were strongly held, and discussions were to remain alive in study commissions and in officers' circles throughout the entire interwar period of more than twenty years, thus affirming the old adage that when all is said and done, more will have been said than done.

---

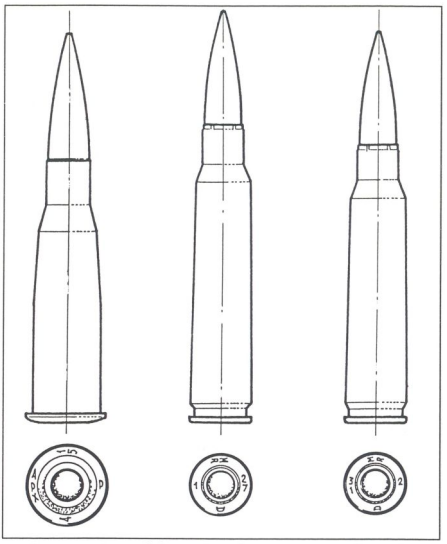
1 Correspondence cited by Boudriot-Lorain-Marquiset in *French Firearms - Regulation Models 1858-1918.*

A Perilous Lookalike Leads to a Fine New Cartridge

It appeared that the astoundingly modernistic 6.5 and 7mm rounds used in the pre-World War I "First Wave" autoloading rifle trials were too far ahead of their time, as they were all ignored in the postwar development of a new standard cartridge. The case chosen was similar to that of the German 7.92x57mm, and the bullet was inspired by the Swiss 7.5x55mm Model 1911 Schmidt-Rubin projectile. Its real calibre was between 7.80 and 7.82mm, close to that of the US .30-'06 (which is in theory 7.62mm). Examples of the new rimless French ammunition first appeared in 1921.

Based on the initial 7.5x59mm project, a new experimental cartridge called the X10 was developed, in 7.5x56mm. In 1922 this cartridge was dropped in favour of a 7.5x58mm round, which was adopted in 1924 together with the MAC (*Manufacture Nationale d'Armes de Châtellerault*) M1924 machine rifle.

At that time the 7.92x57mm cartridge was still being used extensively in France, in troop training exercises with captured German machineguns. With a case only 1mm shorter, the German round was easily mistaken for the nearly identical 7.5x58 French cartridge, and some severe accidents occurred when the larger 7.92mm German bullet was fired in the 7.62mm bore of the M1924 machine rifle. In order to overcome this problem, in 1927 the case length of the Model 1924 cartridge was shortened by 4mm. The resulting cartridge was adopted in 1929 as the long-lived 7.5x54mm Model 1929.



71. A comparison of three French service cartridges, shown with representative headstamps.
Left: 8x50R Lebel.
Centre: 7.5x58mm *Modèle* 1924.
Right: 7.5x54mm *Modèle* 1929.
actual-size drawings by J Barlerin

Six Ambitious Weapons Programmes

In 1921 the French High Command ordered a set of six most ambitious programmes, intended to completely reorganise the French infantry weapons system. Under the 1921 programmes, most of the weapons then in service would be replaced with new models, to be created in the following categories:

- automatic pistol
- machine pistol or submachinegun
- rifle (autoloading or repeater)
- light machinegun
- light mortar
- infantry cannon

A Promise Long Unfulfilled

Certain of these ambitious programmes were rapidly completed (such as the one which resulted in the excellent M1924 Châtellerault machine rifle in 1924), but others took many years: the 7.65mm French long calibre MAS 35 A automatic pistol, and the MAS 38 submachinegun, were not adopted until 1935 and 1938 respectively.

Still other programmes limped on even longer without successful conclusion. This was the case with the autoloading rifle project, established on May 11, 1921. Ironically, as we shall see, two key and essentially French design features of the MAS49, the Rossignol gas system and the tilting, rear-locking bolt (discussed below) were in place within a decade, but the selection of a new rifle was still being hotly debated in 1940, as war with her hated neighbour Germany overcame France for the second time in a quarter-century.

Of course, the underlying reason for the lack of interest in rearmament was that, like the rest of the world, France suffered great economic hardship in the depression that followed World War I, and the indecisiveness of the French politicians in those bleak and uncertain postwar years precluded any final decision that would have required a significant commitment of money. Numerous prototypes were made, but at the top, the Army just didn't seem to be interested . .

New Autoloading Rifle Specifications, 1921

Nevertheless, new specifications for the postwar autoloading rifle programme were established in 1921, as follows:

- weight: 4kg (8.8 lbs) max without bayonet
- length: 1.10m (43") without bayonet
- barrel: 0.60m (23.5") long
- bayonet: blade; 0.40m (15¾") long, capable of being incorporated into the rifle
- the rifle must be simple and sturdy with simple contours, completely protected against mud
- rear sight over the receiver
- fixed barrel without gas regulation
- feeding by 5-round stripper clip
- simple and fast field stripping using only a cartridge
- complete disassembly must be done with only a screwdriver, and be simple enough to be done by all troops
- two-stage trigger, or device indicating when rifle is about to fire
- safety device blocking the percussion of the cartridge if the bolt is not fully closed
- safety lever placed in such a way as to not forget it at the moment of shooting
- capable of firing the VB rifle grenade
- possibility of attaching a blank firing device.

The 1921 specifications remained unchanged until 1940, when the choice of the autoloading rifle to adopt was finally made. By then, however, as with the Meunier rifle in 1913, the decision came too late.

A Shift in Design Authority

The breeding ground for new experimental rifles had shifted from the pre-WWI specialist agencies like APX, ENT and STA due to the demands of the war, and design authority now rested within the three State Arsenals themselves. (Chauchat himself had been promoted to Lieutenant-Colonel and transferred to MAS as Assistant General Manager in 1912.)

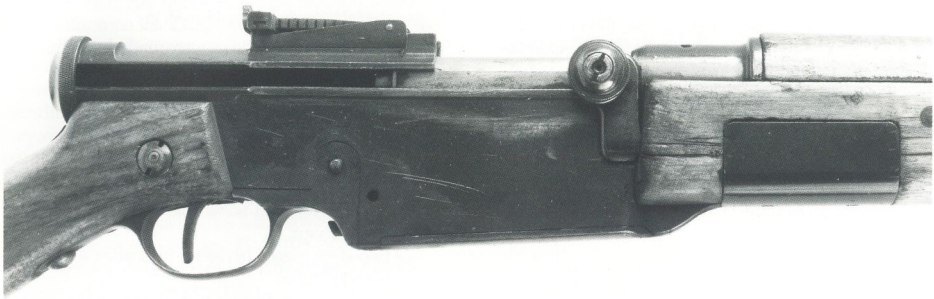
During the first decade of the interwar period the lack of interest "at the top" did not dissuade the designers and engineers at all three French State-owned arsenals from developing new series of autoloading rifles, more or less within the published specifications of 1921.

These are described hereunder, in chronological order of their submission to the Testing Commission.

Shades of the RSC Rifle: the MAS 1918-21

72. The *Fusil Automatique* MAS 1918-21. Presented as yet another conversion, the first MAS 1918-21 prototype was produced in .30-'06. Overall length: 1.120m (44"); barrel length 600mm (23.6"); weight 4.250kg (9.4 lbs).

As the first new rimless cartridge prototypes were being developed in 1920 - 1921, *Manufacture Nationale d'Armes de St-Etienne* (MAS) produced a rifle which, although cannily presented as a transformation of the gas-operated M1918, was in fact a new model. Lacking a definitive French cartridge, the first prototype was built around the US M1906 (.30-'06; 7.62x63mm) Service cartridge. Very soon, a second model was made, chambering the experimental French 7.5mm X10 round.



73. Right side closeup of the MAS 1918-21, the first modern French autoloading rifle produced after World War I.

The two-piece stock was retained, and the mechanism was quite similar to that of the MAS M1918, except for the improved feed system made possible by the new cartridge specifications.

The cocking handle and the rear knurled body cap in particular resemble features of RSC (M1917 and 18) rifles.

74. Left side closeup of the MAS 1918-21, showing markings.

Known as the MAS 1918-21, the original .30-'06 model was presented in January, 1922, but testing was cut short by the forearm bursting near the gas vent after 300 shots. The forend was replaced, but the test was stopped after the ejector and the bolt broke.

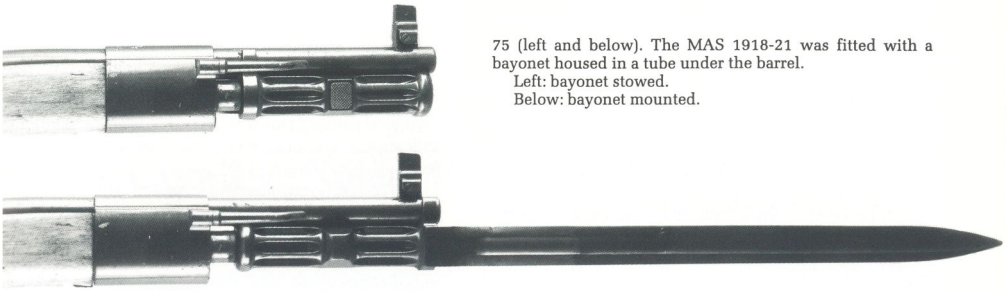
In May, 1922 the calibre .30 rifle was tested again alongside the one in 7.5mm, which was deemed fit for trial at last, but both prototypes were quickly rendered *hors de service* and the test was halted.

Description of the MAS 1918-21

The following description of a third model of the MAS 1918-21, firing the 7.5x58mm cartridge of 1921, was recorded during a comparative trial in May-June, 1924:

. . The MAS 1918-21 keeps the two-piece stock of the M1918, as well as the underbarrel gas piston mechanism, and the rotating, front-locking bolt with its two sets of opposing locking lugs. The peep sight is placed on the rear of the receiver and is graduated from 200 to 2,000m. The magazine is loaded from the top of the receiver by a stripper clip.

On the other hand, nothing seems to have been done to better the imperviousness of the cocking lever slot, which seems quite open to the introduction of foreign matter.



75 (left and below). The MAS 1918-21 was fitted with a bayonet housed in a tube under the barrel.
Left: bayonet stowed.
Below: bayonet mounted.

A handguard covers the rear of the barrel. A bayonet is permanently fixed on the rifle. It has a channeled tubular handle. Its sage-leaf blade is sharpened on both sides with one blood groove. It is housed on the left side of the forearm.

A quick look at this rifle shows that the disassembly and assembly are quite complex.

The trials showed that pressure of the finger on the trigger rapidly became painful because of the shock this component received every time the hammer was cocked. Numerous stoppages were caused by this and other defective interfaces in the operating system, compounded by fouling and "weaknesses in the main parts". The stripper clips designed by MAS were less practical than those existing elsewhere (Mauser; Meunier).

After the 1924 trial the barrel of the MAS 1918-21 was found to be bulged near the gas vent, the forearm had split, the operating rod was bent, and the recoil spring had "slackened".

Resurrecting the Rossignol: the MAS 1922

The disabled MAS 1918-21 was accordingly withdrawn and a new model, the MAS 1922, was developed and presented. In a complete break from the gas impingement system of the Model 1918-21, the MAS 1922 resurrected the 1910 Rossignol direct gas system, which was to remain a key component of the MAS rifle design thenceforth.

The MAS 1922 had an asymmetrical receiver, with the bolt in the centre and the piston/bolt carrier, to which was affixed the cocking lever, on the right. A lateral gas tube transmitted a direct gas impulse to the bolt carrier, which caused the rotation of the twin-lugged, front-locking bolt.

In a break with tradition, the MAS 1922 was made with a one-piece stock with a semi-pistol grip. A handguard covered the barrel to about half the length of the forearm. The stock and handguard were held solidly around the barrel by two bands. The short-lived, internal rotating magazine was inspired by the Mannlicher-Schönauer system.

The peep sight, located to the rear of the receiver, was copied from that of the US M1917 Enfield rifle, with a combat peep sight forming a slide on a vertical leaf, graduated from 200 to 1,600m and protected by integral "ears" on the base.

The MAS 1922 rifle had a permanently attached bayonet like the MAS 1918-21, but the blade was hinged, and stowed flat under the forearm.

Testing the MAS 1922

The prototype described above was presented for the first time in January, 1922. It was noted that the direct gas system was much simpler than that of the MAS 1918-21, and disassembly was easier and quicker.

The rotary feed system (termed a "revolving barrel" in the trials report) was rejected by the trials officers, because it was not possible to increase the capacity of the magazine. In addition, they found that the rifle handled poorly, and was badly balanced.

The trials continued until 1924, the rifle being repaired and modified several times without significant improvement in performance. Each time there were more stoppages (freezing of the firing pin, extraction defects, unreliable feeding, receiver breakage); one report indicated 47 stoppages in 120 cartridges fired—a 40% malfunction rate! The officer in charge finally concluded his report with the words "Interesting rifle but presents many imperfections".

Addressing the Imperfections: the MAS 1922 M

The two years of trials with the MAS 1922 led to a further modified version called the MAS 1922M, wherein the barrel length was taken to 0.57m (22.4") and a stripper-fed Mauser-type magazine replaced the "revolving barrel".

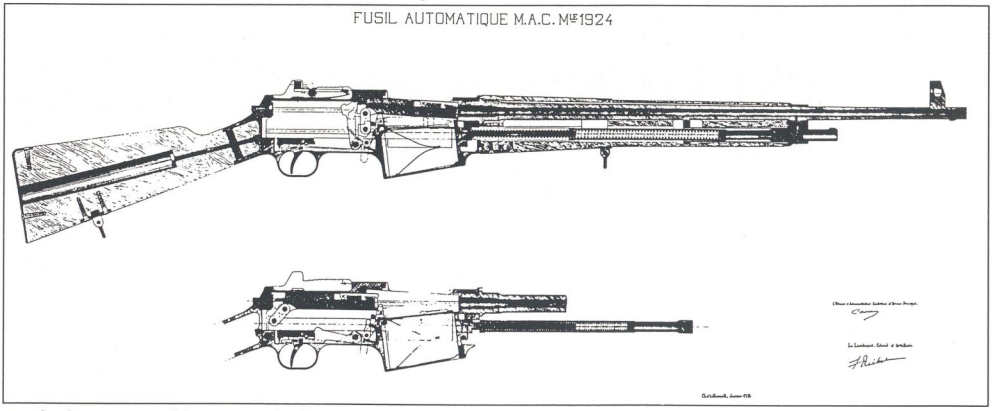
The MAS 1922M was billed as an attempt to address the well-documented defects of the MAS 1922. In this the MAS engineers had their work cut out for them, for the principal functional deficiencies of the Model 1922 had been established as: extraction and ejection problems; unintentional burst fire; and gas escaping into the face of the shooter.

Tested under adverse conditions, the MAS 1922M gave good results in rain but would only work manually after exposure to dust, and would not work at all after being immersed in mud.

The tests continued from 1925 to 1927.

Results revealed real improvement over the preceding MAS models, but the weapon was still not correctly tuned. Sadly, of the three most recently presented MAS rifles (two Models 1922 and one Model 1922M), none was capable of sustained, rapid fire as called for in the trials schedule. They were all pronounced unserviceable after endurance firing of between 700 and 1,300 rounds.

The Reibel System: the MAC 1924



76. The first post-World War I autoloading rifle from *Manufacture Nationale d'Armes de Châtellerault*, the MAC *Fusil Automatique Modèle*1924, perfected by Colonel Reibel. Calibre 7.5x58mm M1924. courtesy CAA

Meanwhile, in 1924 Lt Col Reibel, in charge of Research and Mr Chossé, Weapons Inspector, both of *Manufactures Nationale d'Armes de Châtellerault* (MAC) had also presented a gas-operated autoloading rifle of their design to the Testing Commission of Versailles, in response to the programme of 1921. Known as the Model 1924, this rifle functioned by means of a *forward*-moving piston. A reversing lever acted on the tilting, rear-locking bolt, which was controlled by a system of locking links[2] known as the Reibel System.

The MAC 1924 had a cover over the cocking lever groove, which contributed to the dustproofing of the receiver. It was chambered for the 7.5x58mm Model 1924 cartridge, and was fed by a five-round magazine filled through the use of MAS-type stripper clips.

The Trials Commission noted approvingly that the MAC rifle responded more closely to the criteria defined by the programme of 1921 than did the MAS 1918-21 and Model 1922 rifles that had been presented. However, the first trials of the MAC design were marked

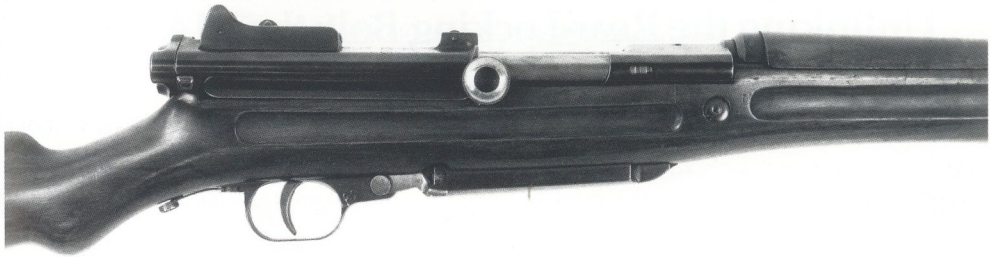
2 The same bolt system as used successfully in the MAC Model 1924-29 machine rifle and other weapons (notably the Browning Automatic Rifle (BAR).

by a number of stoppages due to insufficient recoil, and the rifle was sent back for repairs.

The MAC 1924 rifle was at length re-presented at Versailles in February, 1927. Its accuracy was unsatisfactory, and the arm was again sent back to the factory to be improved.

Goodbye Rotary Bolt: the MAS 1922-26

77. Right side view of the MAS 1922-26 rifle, chambered for the *Modèle* 1924 (7.5x58mm) cartridge. Overall length 1.164m (45.8"); barrel length .597m (23½"); weight 4.430kg (9.8 lbs). Magazine capacity 5 rounds.

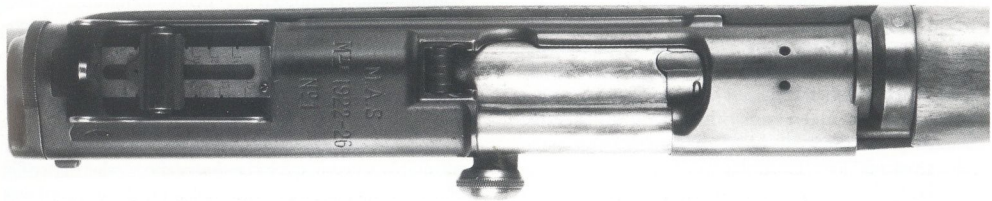


78. A right side closeup of the MAS 1922-26 reveals that criticisms levelled at the "lack of imperviousness" of the MAS 1918-21 had not gone unheeded: the receiver is now well protected against the ingress of dirt and debris. The rear sight resembles that of the World War I US M1917 Enfield rifle.

After two years of extended testing, the listed faults of the MAS Model 1922M had become so numerous that the Trials Commission finally declared the project an evolutionary dead end, concluding that the modifications needed would be "too numerous to be cited". It was decided that a new study had to be done, and the rifle completely redesigned.

After studying the faults of the MAS 1922 and 1922M, the following improvements were incorporated into a new rifle called the *Modèle* 1922-26:

- gas system modified and recoil spring reinforced to increase power to open and close bolt
- extraction problems eliminated
- new trigger mechanism adopted (similar to that of the MAS 1922 machinegun)



79. Top closeup of the receiver of the MAS 1922-26 serial no 1, showing markings. Note the asymmetrical receiver, with the bolt handle/operating rod and gas tube mouth on the right-hand side.

- better interfacing to avoid double feeding
- gas escape eliminated
- dust and water tightness improved by sliding flap over cocking lever slot in receiver
- gas tube so placed that it can be cleaned
- front-locking, rotating bolt fitted with multiple locking lugs (two series of three)

The Rotary Bolt Condemned "Without Recourse"

Trials of the MAS 1922-26, held in 1926 and 1927, showed this model to be superior to the 1922 series. Resistance to adverse conditions was good, although troubles with the trigger and the firing system were still noted, as well as extractor breakages, caused by poor interfacing with the gas system. In addition, the multiple lugs on the bolt made cleaning difficult.

Some of the stoppages were attributed to poor quality ammunition, but even so, in an outspoken statement the CEI (*Commission d'Expériences de l'Infanterie*; Infantry Testing Commission) reproached the MAS designers, saying that some faults of the *Modèle* 1922-26 were the same as those which had been encountered fifteen years previously on the ENT (Rossignol) and STA (Meunier) rifles.

In conclusion, the CEI desired a rigorous redesign of the MAS model, and condemned "without recourse" the front-locking, helical turnbolt system used in all the post-WWI rifles submitted by the MAS factory up to that time.

Unlinking the Rear-Locking Bolt: the MAT 1926

80. Left side view of the MAT M1926, with its hinged bayonet fixed in the open position and "hide-trigger" extended.
photo courtesy CAA

The third State arsenal MAT (*Manufacture Nationale d'Armes de Tulle*) also responded to the autoloading rifle programme of 1921 with an initial prototype designed by Messrs Claudot and Monteil, called the MAT Model 1926.

The MAT 1926 had the traditional two-piece stock built around a massive receiver-and-barrel assembly, with a five-round magazine capable of being fed by stripper clips. The follower was a pantograph design as used on the earlier Meunier rifle.

The MAT 1926 used a gas impingement system with the gas vent close to the muzzle, coupled to a short piston. A system of rods transmitted the impulse to the bolt carrier, which controlled the rear-locking, tilting bolt. Although little is known of this apparently earliest of carrier-operated, tilting-bolt designs, the MAT 1926 was probably an ingenious simplification of the Reibel system bolt as used in the MAC 1924, with ramps in the bolt carrier replacing the links.

The MAT 1926 had two safeties, a crosswise pushbutton inspired by that of the Winchester autoloading carbines of World War I, and a unique automatic safety called the "hide-trigger", which blocked the introduction of the finger into the trigger housing until the safety lever was retracted.

The first tests with the MAT 1926 were held from July to October, 1926. Hits were insufficient, and although stoppages were few (1.5% of 2,500 shots) they were spectacular: violent extractions, case separations and a shooter wounded in the face.

The ingenious design and the dustproofing of the mechanism were particularly appreciated to the point that the Testing Commission (generally sparing with its compliments) enthused: ". . Brings an interesting contribution to the study of automatic weapons; its development merits continuation".

In 1927 a more intensive test was carried out with an improved version of the MAT 1926, the new model having a more ample forearm and a heavier barrel. This raised the weight an additional 200g (.44 lb). The trigger mechanism was inspired by that of the Model 1918 rifle. The bolt unlocking ramps were lateral, the gas vent was inclined, and the recoil spring guide rod was telescopic. The components were manufactured of special steels.

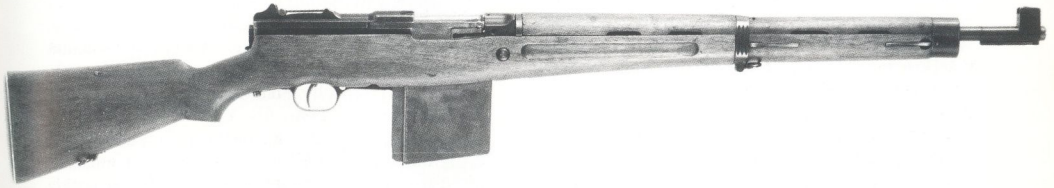
81. The MAT *Modèle* 1926, shown stripped for parts identification. The magazine resembles that of the A6 Meunier of World War I. photo courtesy CAA

At the end of the test, the rifle was still functioning correctly, although it was adjudged delicate, with the following major faults still to be corrected:

- defective feeding
- forearm twisting misaligns the sights
- closing of the bolt becomes difficult due to excessive fouling.

The Commission concluded that problems of excessive muzzle flash were not caused by the rifle, but were due to the use of cartridges loaded with BFP1 powder, which was known to produce a pronounced flash when fired in short-barreled rifles.

The MAS 1928: First Tilting-Bolt from St-Etienne



82. Right side view of the MAS 1928, the first rifle to combine the Rossignol gas system with the rear-locking, tilting bolt. Calibre 7.5 *Modèle* 1924 (7.5x58mm). Overall length 1.122m (44"); barrel length 610mm (24"); weight 4.4kg (9.7 lbs). Magazine capacity 10 cartridges.

The MAS 1928 rifle was presented by *Contrôleur* Chezeaud, earlier the designer of the long-recoil B7 rifle, one of the "first wave" of French autoloaders. By 1928, M. Chezaud was a Weapons Inspector at MAS.

With this model, MAS finally broke away from the problematic front-locking, rotating bolt. The MAS 1928 was the first design to combine a rear-locking bolt with the Rossignol gas system. As the bolt carrier closed, the lower rear face of the bolt was wedged in front of a

83. Two closeups of the MAS 1928 action.

Above: right side view, showing details of rear sight. (The cocking handle is missing from this example.) The general organisation of the receiver prefigures that of the MAS 49 to a considerable degree.

Below: Left side view, showing safety catch, left, and markings. The receiver has a thumb cutout to facilitate loading the magazine on the rifle with stripper clips.

transverse locking shoulder in the hardened steel receiver. This locking system, often latterly copied and whose origins have long been misattributed, was the third key design feature, along with the Rossignol direct gas system (and, later, the two-piece stock), to be carried through into final adoption by France.

The one-piece stock of the MAS 1928 featured a pronounced pistol grip and an aluminum butt plate. The barrel was covered by a ventilated handguard the same length as the forearm.

The gas tube was relocated on top of the barrel. The upper part of the receiver was cut away for unimpeded feeding and ejection.

The magazine held ten cartridges.

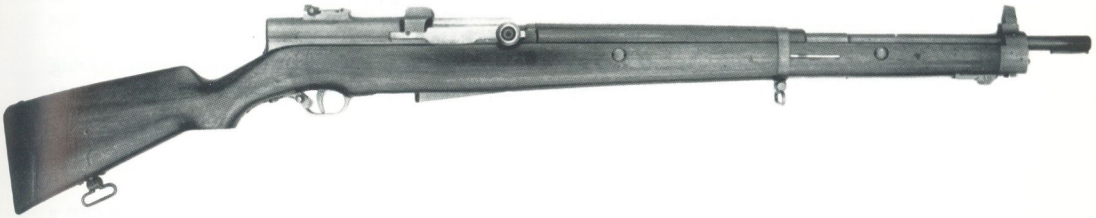
The rear sight, on the rear of the receiver, was graduated from 200 to 1,000m. The cruciform bayonet was placed as on the MAS 1922-26 rifle, and was carried folded under the barrel.

Tests with the rear-locking MAS 1928 began in November, 1928. The rifle showed acceptable accuracy, but stoppages were numerous. When high-pressure cartridges were tested in February, 1929, the rifle worked with difficulty. Following immersion in mud, the bolt refused to open.

Testing continued during the same year with an improved rifle. The results were encouraging but accuracy was now unacceptable and the recoil spring proved too weak.

A final test on the MAS 1928 was done in 1930, but it also was far from giving satisfaction. The same weaknesses were verified, to which were added stoppages due to fouling. Due to this poor showing, the MAS 1928 rifle was judged not worthy of further testing by the troops.

A Third Tilting Bolt: the MAC 1929

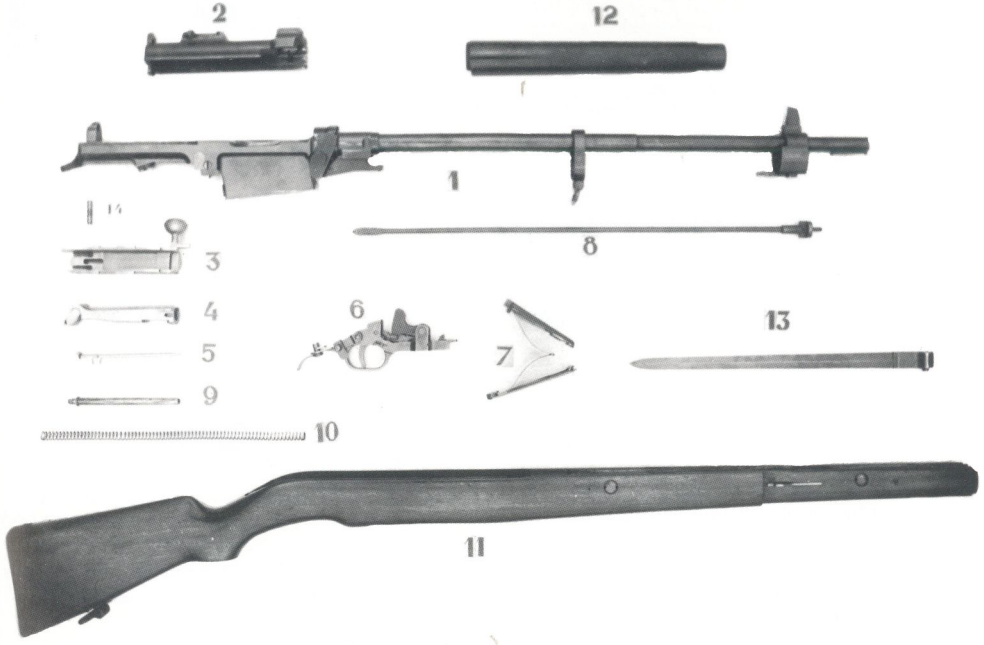


84. Right side view of the MAC *Modèle* 1929, calibre 7.5x58mm M1924.

Overall length: 1.130m (44.5"); barrel length .60m (23.6"); weight 4.300kg (9.5 lbs). Magazine capacity 5 rounds.
photo courtesy CAA

The ordered improvements to the MAC 1924 were at length presented in a new arm called the MAC Model 1929. It fired the 7.5x54mm Model 1929 cartridge, and had a flat-bladed bayonet which folded under the barrel.

The receiver was configured differently to accept the heavy and complex bolt cover, smoothly rounded on top around the rear sight and charging guide, which housed the recoil spring (no longer inside the buttstock). The one-piece stock had a pistol grip. The receiver formed a one-piece magazine housing, fitted with a detachable Mauser-style floorplate, fed by a MAS-type stripper clip with a single indentation.



85. The MAC M1929 stripped, showing parts numbered for trials presentation. The M1929 functioned by gas impingement, the forward-moving piston (8) transferring its impulse through the reversing lever to the bolt carrier (3), which picked up and unlocked the tilting bolt (4).

The stripped receiver looks remarkably similar to that of the later Belgian FAL. photo courtesy CAA

The gas vent on the MAC Model 1929 was located closer to the muzzle, but the action still made use of a forward-moving piston acting on the bolt carrier through a reverser lever (seen mounted on the right side of the receiver in fig 85, just in front of the magazine housing).

However, relocating the operating spring and other modifications had increased the weight of the MAC 1929 to 5kg (11 lbs), one full kilogram more than the maximum specified in the 1921 requirements.

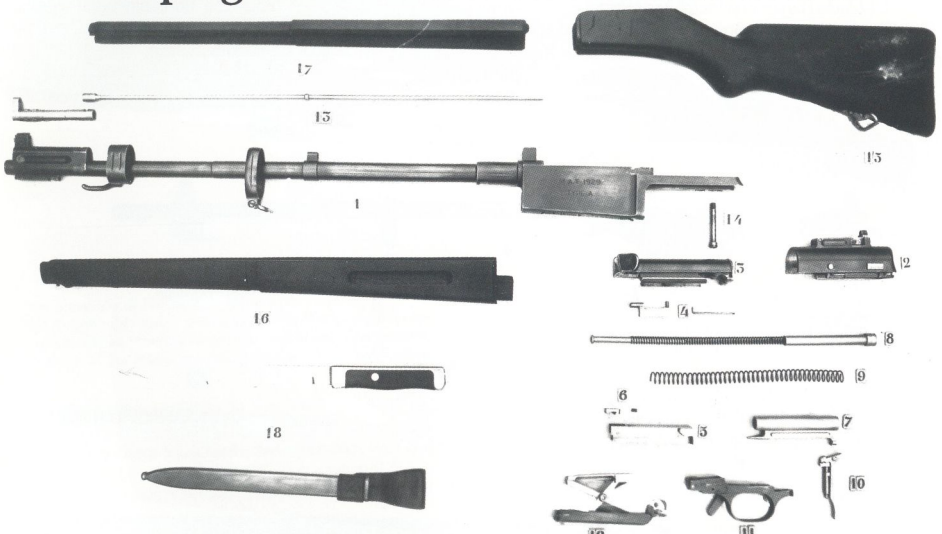
Stoppages, largely attributable to faults in the feeding system, were numerous: 116 in 1,682 cartridges fired, for a malfunction rate of 14.5%.

Additionally, as the rifle heated up during firing, the sighting system became misaligned.

Abandoning the MAC Rifle

The performance results of the MAC 1929 were adjudged inferior to those of entries from St-Etienne and Tulle, and the Commission decided that it was useless to continue the MAC rifle programme. General Bailli, Inspector of Artillery Studies, did not agree, but the inventor Reibel (having in the meantime become a general in his own right) preferred not to continue development of the MAC 1929, as by then he had other responsibilities[3].

Keeping the Two-Piece Stock: the MAT 1929



86. The gas impingement MAT Modèle 1929 Type A, shown disassembled for parts identification. This model featured a detachable bayonet-knife and scabbard as an accessory.
photo courtesy CAA

This was an improvement of the MAT 1926 rifle, which had been the first to feature a carrier-controlled, rear-locking bolt. The MAT 1929 was made in two versions which both bear the same designation, as follows:

3 In addition to perfecting the Model 1924-29 machine rifle, General Reibel designed the tank and fortress MAC 31 machinegun and the MAC 34 aircraft machinegun, and participated in a number of other projects.

- MAT 1929 Type A, with a detachable knife bayonet;
- MAT 1929 Type B, with a tubular bayonet in a permanent housing under the barrel.

In comparison with its predecessors, the Model 1929 incorporated the following improvements:

- modification of the gas vent
- elimination of the operating rod return spring
- replacement of the tilting hammer with a linear striker
- a sturdier forearm without openings
- the rear sight has a serrated slide allowing a prone shooter to adjust his range without changing his position
- an automatic safety which engages when the magazine is opened.

As soon as trials of the MAT 1929 Type A began in Versailles, the bolt retainer broke and the rifle was returned to the factory for repairs.

When the rifle came back the tests started again. Three thousand cartridges were fired with only a few stoppages: sometimes the bolt did not remain in the rear position after the last round from the magazine; and some burst firing took place. The accuracy was poor and the rear sight was too flimsy and became misaligned.

However, the mud test was passed with success and after a simple field cleaning the MAT 1929 worked satisfactorily. In view of this, the Commission encouraged MAT to continue working on their automatic rifle, hoping that further improvements could be incorporated.

Chapter Four

Hi, Ho, Come to the Fair

An international *Concours* of autoloading rifles was organised by Ministerial decisions nos 43.090-2/3 dated May 31, 1930 and No 9144CM/1 of July 8, 1930. Baldly stated, its purpose was to compare the best French and foreign designs in order to ascertain the technical level reached by the various manufacturers.

A complete list of the foreign manufacturers invited has not come to hand, but we know that SIG (*Société Industrielle Suisse*) and CZ (*Ceska Zbrojovka*) each presented one prototype. A Pedersen rifle was also presented by Vickers from England, but it arrived too late to participate.

In France, notice of the event was sent to the Hotchkiss and Darne companies, as well as to the private St-Etienne manufactory of shotguns and bicycles *Manufacture Française d'Armes et Cycles* (not to be confused with the MAS State arsenal).

Conditions of the 1931 *Concours*

The Artillery Department of the War Ministry described the principal aims of the *Concours* in a technical note dated April 10, 1930, signed by General Bailli, Interim Inspector of Artillery Technical Studies and Testing, and approved in the name of the Minister of War by General Mussel, Director of Artillery, on May 31, 1930. In this document the terms and conditions of the *Concours* were meticulously spelled out, as follows:

I. Weapons from State Enterprises or Departments

Presentation of Autoloading rifles

The competing rifles must be presented complete, with their accessories, to the Testing Commissions of Versailles and of Châlons before March 1, 1931. At least one of these Commissions must have one sample.

Conditions to be Fulfilled

The competing rifles must fulfil as closely as possible the specifications of the May 11, 1921 programme [reprinted in Chapter Three].

The rifles will be chambered for the Model 1929 [7.5x54mm] cartridge.

Nature of the Tests

Testing will be conducted, whenever possible, in identical fashion for all the models presented, and will take place progressively as the presentations proceed.

All firing will be done with ammunition accepted by the Ammunition Reception Commission, classed as good for service.

When the time comes for their use, the cartridges will be subjected to pressure, velocity and precision firing tests with a specially chosen rifle as a reference. After this, the ammunition will be fired for examination of velocity and accuracy with the different competing rifles.

Once this is done, the following tests can be undertaken:

Elimination Trials

The two Commissions [Versailles and Châlons] will operate independently, one from the other. Neither will undertake the testing of a rifle unless that rifle has fired successfully, without cleaning, five series of one hundred cartridges, each series being separated from the others by cooling the barrel with water. The rate of fire will be fifteen shots per minute.

Considering the number of cartridges fired, this test should not give rise to more than a 2% rate of stoppages, nor to the breakage of any part whatsoever.

If unsuccessful, the test can be repeated several times if needed after the rifle has been revised by the manufacturer until the limit date which has been fixed for this Concours. After that deadline, the test can be done only one more time. If it fails again in Versailles and Châlons, the rifle will be eliminated.

Should the failure happen with only one of the Testing Commissions, testing can be renewed after the rifle has been revised by the original manufacturer. The other Commission will continue carrying out the testing as required in the Concours.

Schedule of Trials

Testing will consist mainly of a succession of function firings of 50 or 100 cartridges, separated by the necessary time to cool the weapon by air or water, repeated as many times as possible without cleaning, until regular functioning is definitively stopped.

The accuracy and sight adjustment will be noted at the start of the tests. Later they will be taken periodically, when the rifle is hot and when it is cold.

Firing tests will also be done:

- *with high- and low-pressure cartridges;*
- *with rifles and ammunition previously cooled to less than 0°C [32°F];*
- *with dusty cartridges;*
- *with rifles previously plunged into dust and then mud;*
- *in any special condition which the Testing Commissions feel is useful.*

Jury and Sanctions

According to the results obtained by the two Commissions, rifles will be classed in order of preference by a Jury made up of delegations from the Infantry, Cavalry and Artillery Technical Departments. They will be assisted by representatives of the Inspector General of the Artillery Plants and of each of the interested Testing Commissions as consultants.

The Jury will be presided over by the Inspector General of the Artillery Technical Studies and Testing. When the final results are reached, he will present to the Minister of War the concluding recommendations.

In principle, the rifle that is classed first will win a prize of 25,000 Francs, the second will win 15,000 Francs and the third 10,000 Francs.

There will be special prizes for rifles entered by State Enterprises or Departments.

These prizes will be assigned to the authors of the studies, made according to the proposals of the Directors of the Enterprises or Departments.

II. Rifles Originating from Private or Foreign Industry

The rifles originating from private industry will be examined, presented and tested, as much as possible, in the same conditions as the State-produced rifles.

Nevertheless, these rifles are not obliged to fire the Model 1929 cartridge[1].

Only one sample will be presented, to be examined consecutively by the Testing Commissions of Versailles and then of Châlons. The Versailles Commission is the only one authorised to do the elimination test.

Should the Jury find it possible, they will be classed the same way as rifles from French State Enterprises or Departments.

No prizes will be awarded to rifles coming from private industry; but, so as to stimulate in some measure the owners to present their weapons, a compensation of 5,000 Francs will be awarded to all models which pass the tests.

In addition, a few dozen rifles could be purchased of the model which finishes at the head of the general classification (or particular classification for weapons from private industry if it is not convenient to establish a general classification). The purchase could be made to carry out extended tests if the price is acceptable.

---

1 Foreign weapons could be chambered for ammunition between 7 to 8mm, with an equivalent power of the 7.92 Mauser cartridge.

Spotting the Wolf in Sheep's Clothing

The *Concours* terms and conditions (above) exhibit a frank bias in favour of the French State arsenals, to whom rewards and a probable positive result were promised, even before the tests had begun.

Commercially, therefore, the contest (or pretense of such) had no other aim than to entice private industry into presenting their latest models for free trial and inspection, during which it was hoped and expected that the military would discover new ideas, the cleverness of which might have escaped the engineers from the State enterprises.

This deception proved a bit too much for French industrialists to swallow. None of those invited attended, although it should also be stated that none of them could have provided an autoloading rifle within the time frame of the *Concours*.

Neither would they have wanted to bother, as their order books were full: Hotchkiss was producing machineguns and quick-firing cannon for the French Army and for export; Darne made shotguns and aircraft machineguns; even the *Manufacture Française d'Armes et Cycles* of St-Etienne put out a commercial catalogue offering a wide selection of pistols, rifles, carbines and shotguns.

Elimination trials took place during the spring and summer of 1931. The *Concours* itself began in the fall of 1931 and concluded in January, 1932. Five rifles—one from MAS, two from MAT, one from Czechoslovakia and one from Switzerland—participated.

How the Entries Fared

The MAS 1928-31

87. Right side view of the *Fusil automatique MAS Modèle* 1928-31, calibre 7.5x54mm M1929. Overall length: 1.120m (44"); barrel length 600mm (23.6"); weight 4.035kg (8.9 lbs). Magazine capacity 5 rounds. photo courtesy CAA

The MAS 1928-31 evolved from the rear-locking MAS 1928, described in the preceding chapter, now chambered for the 7.5x54mm Model 1929 cartridge but still mounted in a one-piece stock.

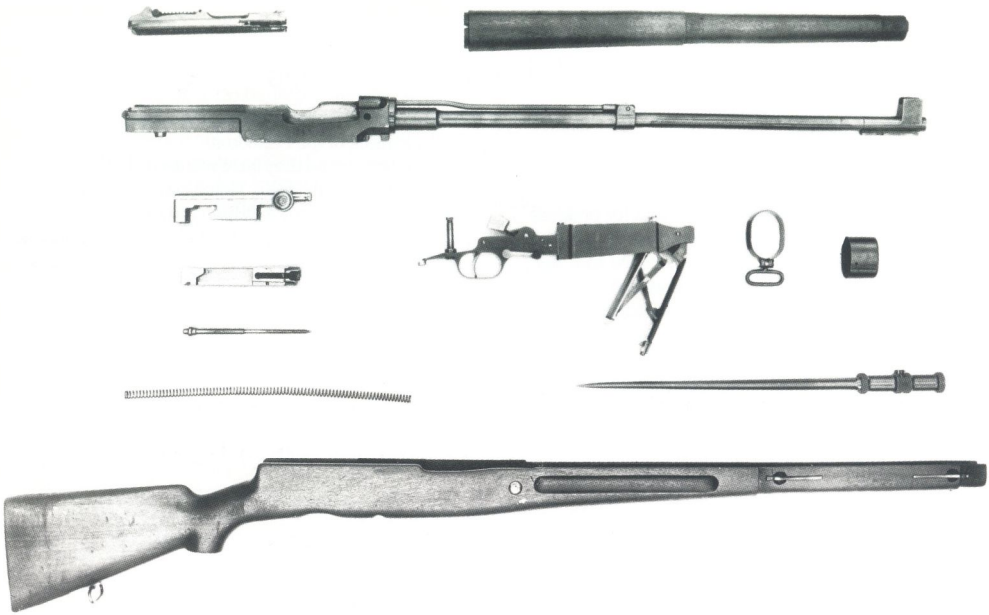
The receiver had been redesigned to improve its functioning and some different arrangements had been made: the bolt cover was now fitted with a locking latch; the sear was reinforced; and some machining angles on the flats of the bolt had been deleted.

The MAS rifle worked quite well, passing all the tests with only 1.91% stoppages. Furthermore, it was the most accurate of the five rifles tested.

It worked perfectly during the adverse conditions tests, notably shooting in extreme cold.

Both Commissions appreciated its good and sensible design, its ease of disassembly and simplicity of manufacture. They did indicate that they would like better dustproofing, that the magazine follower should be revised and that some parts should be reinforced, as they were thought to be too weak (locking shoulder, firing pin, cocking handle). The one-piece stock was also judged to be too fragile.

The MAS 1928 rifle had already fired 3,600 rounds in 1929, and fired more than 7,500 during the *Concours*. It should also be stated that it was expressly manufactured from ordinary steels, even though the other competitors used special alloy steels. The combination of plain carbon steel and the punishment of the endurance trial proved too much: during a high-pressure test with a bullet in the barrel, the receiver fractured.



88. The MAS M1928-31, shown stripped for parts identification. As can be seen, MAS opted to continue using the one-piece stock, with the magazine box as part of the trigger housing assembly.

Note (from left) the bolt and carrier; the gas *adducteur* on top of the barrel; and the pike-type bayonet, stored in a tubular housing in the forearm. photo courtesy CAA

The MAT 1931: Still Championing the Two-Piece Stock

89. Right side view of the *Fusil automatique MAT Modèle* 1931 Type A, calibre 7.5x54mm M1929. Overall length: 1.050m (41.3"); barrel length 570mm (22.4"); weight 3.970kg (7.75 lbs). Magazine capacity 5 rounds.

photo courtesy CAA

Presented by *Manufacture Nationale d'Armes de Tulle* (MAT) as an improvement of the MAT 1929 rifle, discussed in Chapter Three. The gas system had been modified, and the feeding mechanism was different. The safety lever and the trigger had been "reviewed", and a slide had been added to the rear sight. Both the percussion and recoil springs were now coil springs.

Chambered for the 7.5x54mm Model 1929 cartridge, the MAT 1931 was presented in two versions:

- Type A with a detachable knife bayonet, gas vent 68mm from the muzzle, 'X'-shaped magazine follower (derived from that of the Meunier rifle);
- Type B with a tubular bayonet housed in the forestock (fig 92).

On the Type B, the gas cylinder was shorter and simpler than on the Type A, and the Type B's gas vent

90. The MAT Model 1931 Type A shown stripped for parts identification. The Type A was fitted with a bayonet lug for a detachable knife-bayonet (shown at bottom with its scabbard).

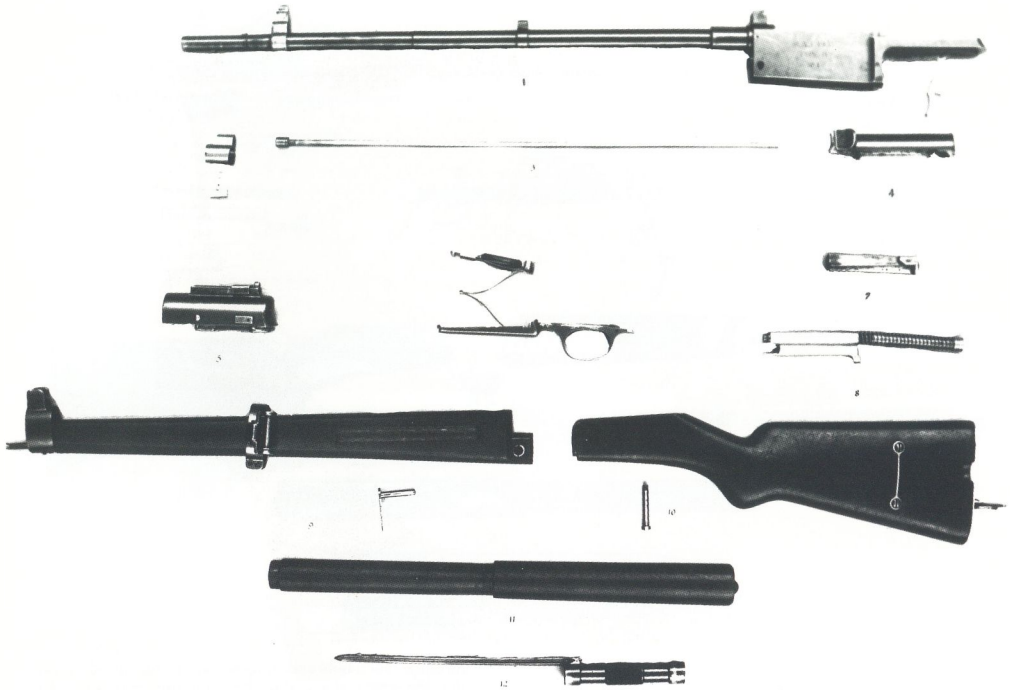
As can be seen here and in fig 92, MAT continued the idea of the two-piece stock and the slim but rigid one-piece receiver/magazine housing/barrel assembly.
photo courtesy CAA

was 75mm from the muzzle. The spring guides were mounted on a single support. The unguided magazine follower was similar to the Mauser follower with a spring in the shape of the Greek letter sigma (Σ).

Neither MAT entry performed perfectly in all the trials, and the Commissions evaluated the two models differently. The tubular bayonet housed in the stock of the Type B was rejected. During the tests, a greater number of parts broke and more stoppages happened with Type B (3.91%) than with Type A (2.45%), although accuracy was satisfactory with both models. The attention which the designers had obviously paid to dustproofing the mechanism was particularly appreciated; and the MAT 1931 launched VB rifle grenades with complete satisfaction.

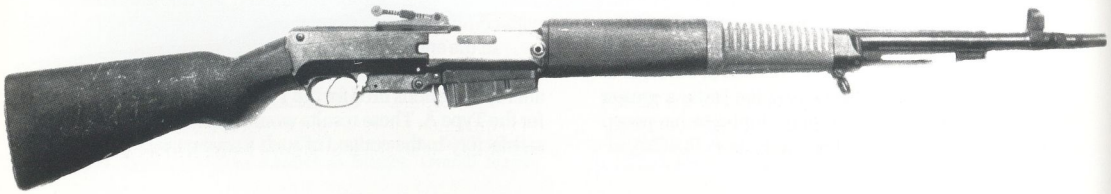
In the endurance trial both MAT models stood up very well, with serious breakdowns not appearing until after 6,750 rounds fired for the Type B and 7,500 rounds for the Type A. These results would appear completely satisfactory in the context of such a severe trial.

91. Left side view of the MAT Model 1931 Type B. As noted in the text, the Type B differed from the Type A in some details, and featured a tubular bayonet housed in the forestock.
photo courtesy CAA



92. The MAT Model 1931 Type B, shown stripped for parts identification. The principal differences between the Type A and the Type B concern the gas system (in the Type B the gas vent is located 7mm further away from the muzzle); the magazine; and the bayonet. photo courtesy CAA

The Czech ZH29, with Side-Locking Bolt



93. Right side view of the side-locking Czech ZH29, a gas-operated rifle firing the 7.92mm Mauser cartridge. Overall length: 1.145m (45"); barrel length .590m (23.2"); weight 4.550kg (10 lbs). Capacity of magazines: 5, 10 or 20 shots. photo courtesy CAA

The ZH29 was a gas-operated Czech rifle firing the 7.92mm Mauser cartridge. It used a tilting bolt inspired by the ZB26 machinegun, which locked sideways in a horizontal movement. The recoil spring was located inside the buttstock.

The stock was in two parts, the forend extended by an aluminum heat dissipator. Feeding was through five- or ten-round box magazines. The twenty-round ZB26 machinegun magazine could also be used.

The tangent sight had an open 'U' notch.

The rifle had a gas regulator, and was equipped with a knife bayonet.

Testing was done with Czech-made 7.92mm ammunition supplied by the rifle manufacturer.

94. For cleaning and inspection, the Czech ZH29 featured a simple and novel breakopen action, similar to that used on the Czech ZBvz26 light machinegun and, later, the FAL rifle.
photo courtesy CAA

The Commission indicated that ZH29 was a bit heavy, and the design of its rear sight did not correspond to the specifications of May 11, 1921.

In firing tests the ZH29 rifle proved accurate; it tolerated overpressure rounds with equanimity; and it worked quite well in cold temperatures. On the other hand, it did not do well in the mud test.

The recoil was pronounced; heavy enough to render shooting painful after a few shots. The comb of the stock repeatedly hit the shooter on the cheek.

Stoppages were rare during function tests (1.71%). Endurance testing was stopped after 4,300 rounds because the supply of 7.92mm ammunition ran out.

The *Société Industrielle Suisse* (SIG) KE 9

This Swiss rifle was initially chambered for the 7.5mm M1911 Schmidt-Rubin cartridge, but had been modified to 7.92mm Mauser calibre for export.

The KE9 had a one-piece stock. The handguard that surrounds the rear sight covered the barrel to the end of the shaft. The four-groove barrel had a twist of

95. Right side view of the Swiss KE 9 rifle, the second and final foreign entry submitted to the 1931 French *Concours* of autoloading rifles. Calibre 7.92mm Mauser. Overall length: 1.090m (43"); barrel length 600mm (23.6"); weight 4.665 kg (10.28 lbs). Magazine capacities 5 or 10 rounds.
photo courtesy CAA

96. The Swiss KE 9 shown stripped into major groups for parts identification, revealing the rifle's complex mechanism. photo courtesy CAA

250mm (1 turn in 9.8") and was held to the stock by two bands.

The mechanism of the Swiss KE 9 was complex, and worked by short barrel recoil. A link (named the "drive") was fitted with an amplifying lever which accelerated the opening of the bolt carrier. This last had a cocking piece fitted with a yoke which carried the tilting bolt.

The rear sight was identical to that of the Schmidt-Rubin Model 1911 rifle, calibrated to 2,000m. Five- and ten-round magazines were available.

This rifle did not fulfill the initial programme requirements because of the barrel recoil system and the U notch rear sight. It was adjudged heavy, and badly protected against mud. Its disassembly and assembly were termed "slow and delicate".

Firing was done with 7.92mm Mauser ammunition furnished by Manurhin. Accuracy was mediocre.

Tests of the Swiss KE 9 were marked by numerous incidents, due to the frailty of the main parts, and feeding deficiencies. The latter were blamed on the magazine, which appeared dimensionally too scant for the 7.92mm cartridge.

During the endurance trial the KE 9 registered the worst results of the five entries. By the time the trial was stoppped it had fired 3,500 rounds, and had broken two firing pins, one accelerator and one extractor.

Cherry-Picking the *Concours*

At the end of the 1931 *Concours* none of the rifles submitted was judged sufficiently perfected to be considered for adoption, although significantly, two of the French entries, the MAS 1928-31 and the MAT 1931, had clearly outdistanced all the other competitors.

The real value of the *Concours* came after everyone had packed up and gone home. After analysing the test results of the best performers, the Versailles Trials Commission was able to pick the best features (which, it turned out, were all products of the French State arsenals), and *combine* them into a state-of-the-art rifle.

First, taking a lesson from the limited endurance of the plain-steel MAS 1928, the Commission specified manufacture from special steels. The new rifle would fire the Model 1929 (7.5x54mm) cartridge, and would embody the following combination of proven features:

- the gas mechanism of the MAS 1928-31
- the rear-locking bolt of the MAS 1928-31
- the two-piece stock of the MAT 1931
- the bolt cover of the MAT 1931
- a five- round magazine fed by stripper clip[2]
- stock, metal fixtures and bayonet similar to the repeating rifle which was being studied[3]

The French military were pleased with the results of this first international *Concours*, and revived the idea several times during the 1930's, notably during the selection of the automatic pistol in 1933[4].

2 The detachable and thus rapidly interchangeable magazine was not a determining factor in the military mind of the time. Although the ZH29 rifle demonstrated that it was feasible to use the large capacity magazine of the light machinegun, the value of this concept was not appreciated until later.

3 At the same time as the autoloading rifle was being perfected, a new repeating rifle was being developed which in a few years would become the MAS 36. The MAS 36 had been presented many times as a transitional rifle while the new autoloading rifle was being perfected. We believe that the intention of the French High Command at the time was to reserve the autoloading rifle for front line troops, and to issue the repeating rifle for rear echelon troops and services.

4 See the author's *French Automatic Pistols* and the editor's *The Browning High Power Automatic Pistol.*

97. By 1939 the French Army should have been equipped with a modern autoloading rifle, but instead was forced to go to war for the second time in a quarter-century with a collection of no less than seven different obsolete bolt-action repeaters. From top:

- Lebel *Fusil Modèle* 1886-93, cal 8x50R Lebel
- Mannlicher-Berthier *Fusil Modèle* 07-15
- Mannlicher-Berthier *Fusil Modèle* 1916
- Mannlicher-Berthier *Mousqueton* (Musket) *Modèle* 1916
- Mannlicher-Berthier *Fusil Modèle* 07-15 M34, cal 7.5mm
- Lebel *Mousqueton Modèle* 1886-93 R 35
- *Fusil* MAS 36.

Chapter Five

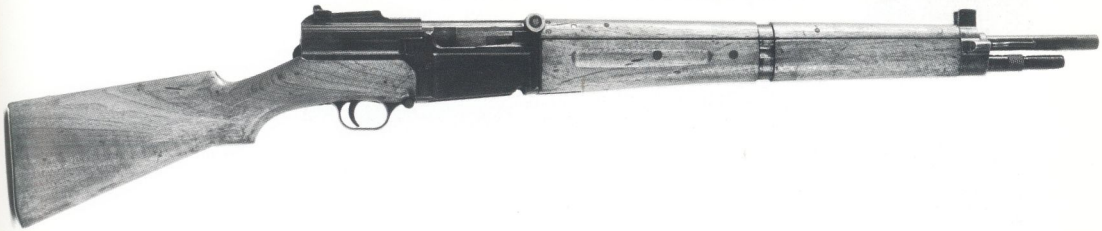
Caught Short Again in WWII

1930 - 1940: A Decade of Denial

The *Concours* Leads to the MAS 1938

The search for the ideal semi-automatic rifle continued at St-Etienne (MAS) after the *Concours* of 1931-32 had ended. The MAS 1928-33, MAS 1934 and MAS 1938 rifles were tested successively.

Vindication on the Eve of Darkness: the MAS 38-39



98. The result of the *Concours*: the autoloading *Fusil automatique* MAS 1938-39, showing some family resemblances, notably to the autoloading MAT 1931 and the bolt-action MAS 36. The MAS 1938-39 was the first to establish that autoloading rifles could consistently perform as reliably as existing bolt-action arms. Results of 1940 shooting trials at moving targets proved that the MAS 1938-39 was superior to the manual repeating MAS 36.

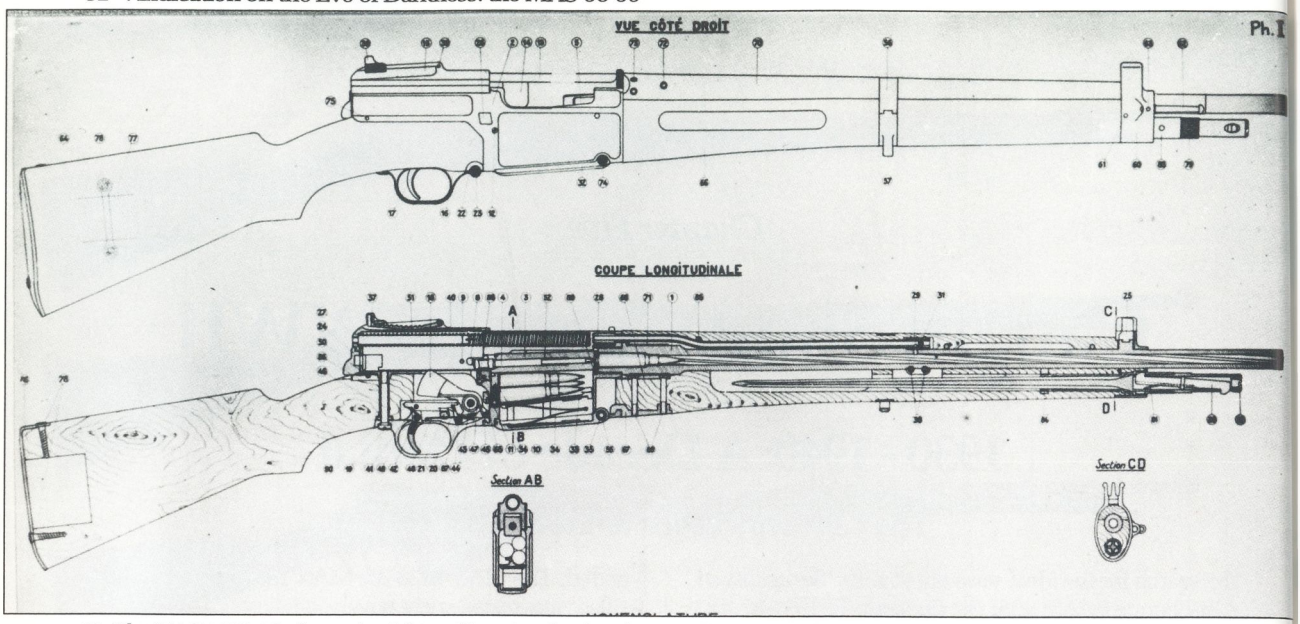
Some further improvement to the MAS 1938 resulted in a new model called the MAS 1938-39. The forerunners of this model had participated in different tests, where they were able to demonstrate their efficiency. They had aroused interest in both the Infantry and the Air Force for its first units of paratroopers, which had just been created. It was felt that finally, a technically reliable rifle had been found in the MAS1938-39.

The MAS SE 1939-39 was presented by the MAS *Service des Etudes* (Studies Department) at Versailles on July 21, 1939. It was quite successful, firing 5,670 rounds with an overall stoppage rate of only 2.3%. The rifle was returned to the manufacturer for minor improvements. Upon its return, it was again subjected to tests during the month of November, 1939 (two months after World War II had begun).

These tests were carried out in a particularly rigourous manner:

- endurance firing, 5x100 cartridges without cleaning or greasing;
- low temperature tests;
- dust exposure;
- mud bath.

Finally, the MAS Studies Department engineers had indeed produced a robust arm of which they could be proud. Both prototypes of the MAS 1938-39 passed the tests with success, averaging only 0.49% stoppages.



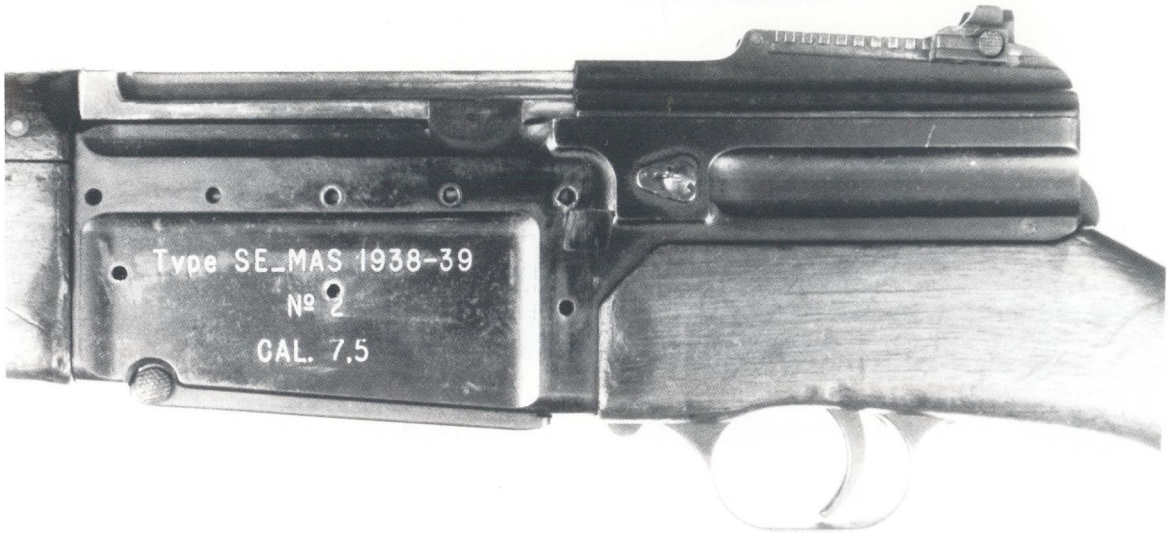
99. The MAS 1938-38, shown in right outline view (top) and section view (bottom), with components numbered in accordance with the Nomenclature list below. The cross-section at A - B (through the receiver) reveals the extreme slimness of the MAS design. document courtesy MAS

Components, *Fusil Automatique* MAS 38-39

1. Barrel
2. Receiver
3. Bolt
4. Firing pin
5. Extractor
6. Ejector
7. Ejector pin
8. Ejector stop
9. Ejector stop screw
10. Bolt stop
11. Bolt stop plug
12. Bolt stop screw
13. Bolt carrier
14. Bolt carrier side plate
15. Body cover
16. Trigger housing
17. Trigger
18. Hammer
19. Trigger bar
20. Sear
21. Safety lever pin
22. Safety lever
23. Safety lever plunger
24. Bolt cover catch
25. Front sight
26. Bolt rest/headspace pin
27. Recoil spring guide
28. Gas tube
29. Gas sleeve
30. Gas sleeve screw
31. Gas tube pin
32. Magazine opening
33. Elevator
34. Elevator spring
35. Magazine floorplate catch
36. Magazine floorplate catch pin
37. Sight leaf
38. Sight leaf cursor
39. Sight leaf pin
40. Sight leaf spring
41. Trigger and connector pin
42. Trigger pin
43. Hammer pin
44. Sear pin
45. Hammer spring hook pin
46. Triggerguard screw
47. Hammer spring
48. Sear spring
49. Trigger spring
50. Bolt cover spring
51. Recoil spring
52. Rebound spring
53. Extractor spring
54. Bolt stop spring
55. Magazine clamp spring
56. Lower band
57. Sling loop
58. Lower band pin
59. Lower band screw
60. Upper band
61. Upper band screw
62. Quillon (Stacking rod)
63. Upper band and quillon pin
64. Stock
65. Stock crosspin
66. Forearm
67. Forearm reinforcement
68. Reinforcement ply
69. Reinforcement/frame screw ?
70. Handguard
71. Handguard liner
72. Handguard liner rivets
73. Handguard washer
74. Magazine floorplate plunger

continued at bottom of facing page

100. Right side closeup of the action of MAS 1938-39, serial no 2. As noted in the text, several dozen examples of this rare rifle were issued to troops of the 1st Regiment of *Cuirassiers* (4th Reserve Division) for trials in May, 1940. Most were recalled and destroyed, but serial no 2 was "liberated" and brought to the USA. courtesy Robert S Eddy III

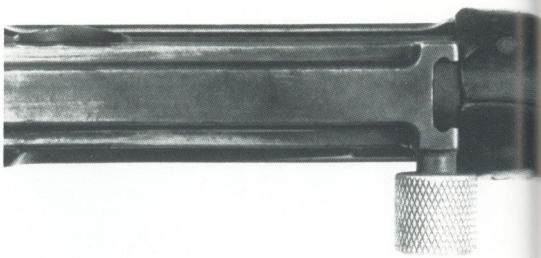


101. Left side closeup of the action of MAS 1938-39, serial no 2. Note the threaded screw-holes in the receiver. As depicted below, this rifle was modified in May, 1940 for trials of the APX M 686 telescopic sight (fig 108).
courtesy Robert S Eddy III

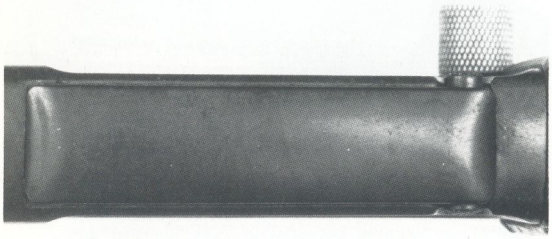
99 (continued from previous page).
75. Receiver cover spring pin
76. Buttplate
77. Sling bar
78. Buttplate and sling bar screws
79. Bayonet
80. Catch lever
81. Catch lever spring
82. Handle plug
83. Bayonet support
84. Support nut
85. Handguard peg
86. Trigger guard screw bushing
87. Sear peg?
88. Bolt rest stop screw
89. Introduction pin?
90. Trigger screw washer

document courtesy MAS

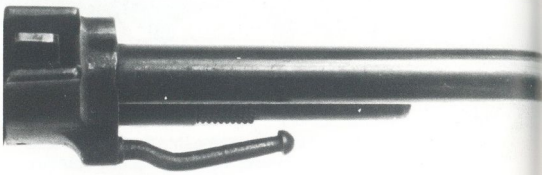
102. Top closeup view of the rear peep sight of the MAS 1928-39. courtesy Robert S Eddy III



103. Top closeup view of the breech area of the MAS 38-39. Note the charger guide, built in to the bolt carrier. courtesy Robert S Eddy III



104. Bottom closeup view of the magazine floorplate of the MAS 38-39. courtesy Robert S Eddy III



105. Right side closeup of the muzzle are of the MAS 38-39, showing the protected front sight, and the knurled catch of the stowed bayonet under the barrel. (The stacking rod has been bent.) courtesy Robert S Eddy III

Hasty Plans for War

Meanwhile, the war had accelerated the pace of developments: the fielding of a modern rifle had rapidly become an urgent priority. On December 19, 1939, the Minister of War had asked the MAS management to begin production of the MAS 1938-39 rifle as quickly as possible. The requirement was estimated at 100,000 units, to be delivered at a rate of 1,000 monthly.

MAS management pointed out that they were, in fact, being asked to maintain production of the Model 36 bolt-action rifle *and* turn out 100,000 examples of the new autoloading model as well, without increasing their manufacturing plant. They flatly stated that production of the new rifle could only be accomplished by its taking precedence over, but without abandoning, manufacture of the Model 36 bolt-action rifle.

Terms were arranged, the plant indicating on January 11, 1940 that the first series production autoloaders could be expected in the first months of 1941.

Proving the Superiority of the Autoloader: More Shots; More Hits

The prototype continued to be fine-tuned to obtain optimal performance, although trials results on file with the Central Armament Archives (CAA) show that the MAS 1938-39 was already performing satisfactorily.

With functional reliability no longer an issue, the advantages of the autoloader over the manual repeater began to emerge. A head-to-head practical firing trial at Satory on January 8, 1940 between the MAS 36 and the MAS 38-39 rifles showed that, even though the rate of fire of the autoloader was not as spectacular as had been anticipated, the number of hits on the target spoke volumes.

Firing at moving targets, a shooter armed with the bolt-action MAS 36 fired 54 cartridges and hit the target 19 times. A shooter with a MAS 38-39 autoloading rifle fired 72 rounds and scored 40 hits. This gave the bolt-action MAS 36 shooter a 35% hit rate, whereas his comrade, armed with the semi-automatic MAS 38-39, turned in a 55% hit rate under the same conditions!

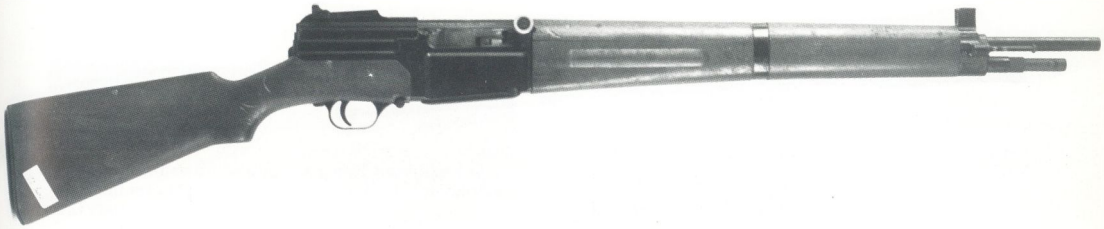
Other tests were held at the same time at La Courtine Camp. In his conclusions of February 8, 1940, the reporting officer complimented the qualities existing in the MAS 38-39.

Troop Trials in Early 1940

Troop trials of the MAS 1940 rifle were now begun. In March 1940, the Minister War asked that 50 to 100 autoloading rifles be manufactured as rapidly as possible. The manufacturing plant agreed to deliver the rifles in July, 1940.

In May 1940, several dozen MAS 1938 or MAS 1938-39 rifles were given to troops for testing, notably to the 1st Regiment of *Cuirassiers* (4th Reserve Division). Most of these rifles were recalled and destroyed; it is not known if any went through the ordeal by fire.

Perfection Too Late: the MAS 1940



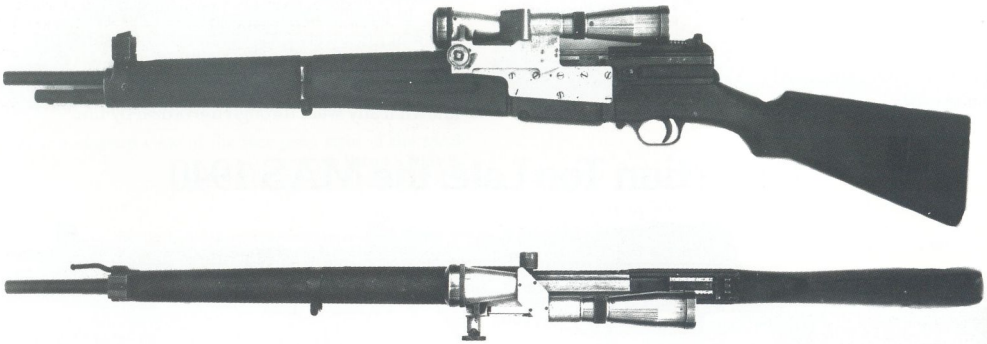
106. Right side view of the *Fusil automatique* MAS 1940, the definitive version resulting from trials with the MAS 38-39. Overall length: 1.065m (42"); length with bayonet fixed 1.365m (53.7"); barrel length .580m (22.8"); weight 4.100kg (9 lbs). Magazine capacity 5 rounds.

107. Left side closeup of MAS 1940 serial no 4, showing markings.

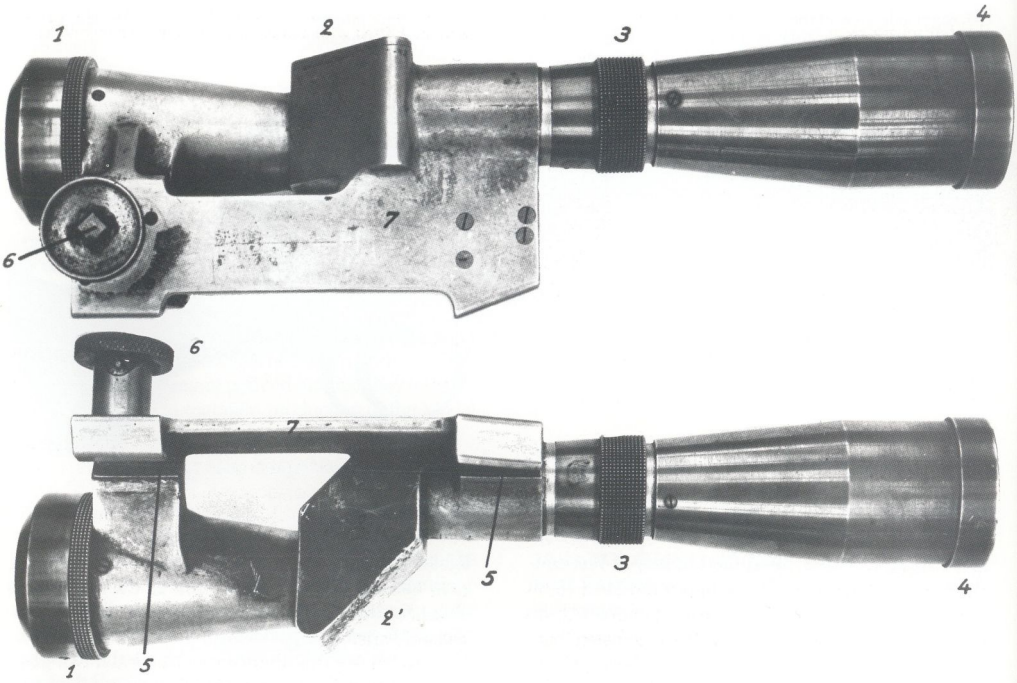
Meanwhile, in March, 1940, the Ministry of War confirmed the order for 50 rifles, adopting the MAS 38-39 rifle as the *F.A. Modèle 40* ([Semi-] Automatic Rifle Model 1940) by Ministerial Decree 430.743.8.14.1.

The MAS 1940 is very similar to the later MAS 49 rifle. The gas tube and bolt assembly in particular are very close. The receiver is almost the same as that of the bolt-action MAS 36 rifle (fig 97 no 7), and also has lightening cuts on the sides. It has a five-round magazine, although the magazine well of the MAS 40 is dimensionally not the same as the one on the MAS 36. The small ejector stop is triangular. The rear sight is also close to the one on the MAS 36, as are the two-piece stock, the handguard, the metal fittings, and the bayonet.

Sniper Trials with Telescopic Sights



108. May, 1940 trial of MAS 1940 serial no 5, with APX M 686 prismatic telescopic sight attached.
Above: left side view, showing location of mount.
Below: top view, showing overbore position of objective lens.
This extremely heavy unit proved "disastrous" in practical trials, but it did position the line of sight over the bore.
courtesy CAA

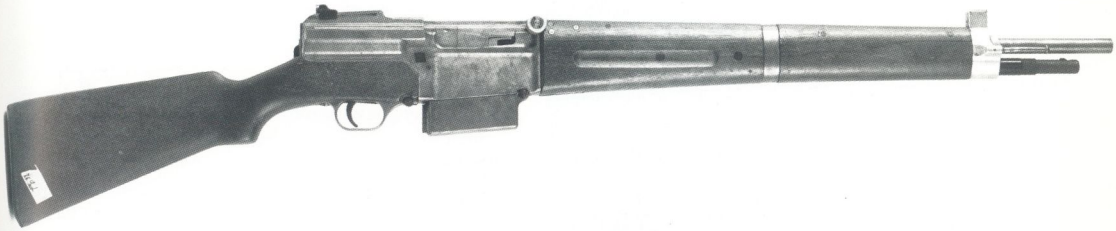


109. The experimental prismatic telescopic sight *Modèle* APX M 686 and mount as affixed to trials MAS 1940 rifles.
Above: left side closeup, showing location of the six mounting screws.
Below: bottom view, showing prismatic construction of the scope which positions the objective lens of side-mounted scope over the line of the bore. courtesy CAA

A MAS 40 rifle equipped with a telescopic sight developed at *l'Atelier de Puteaux* and known as the APX M 686 was also tested in May, 1940. The sight was mounted on a base screwed to the left side of the receiver. By means of a central prism the objective lens of the side-mounted APX M 686 was centrally positioned over the bore of the rifle. The infinite-focus reticle had the image of an auxiliary post, which covered the normal front sight. To aim the rifle, it was sufficient to make the post coincide with the target.

The system seemed interesting but test results were a disaster. The issue telescopic sight, the Model 1921, was quickly reinstated as it provided better performance. It was anticipated that each infantry section would have one sniper equipped with a telescopic-sighted rifle.

Experiments with Detachable Box Magazines



110. MAS 1940 experimentally fitted with a 10-shot detachable box magazine.

The receiver has been cut away to make a wider magazine well, and fitted with a pressed aluminum receiver cover.

111. Right side view of the *Fusil automatique à Chargeur* (autoloading rifle with detachable magazine). Overall length: 1.085m (42.7"); length with bayonet fixed 1.385m (54.5"); barrel length .582m (22.9"); weight 4.190kg (9.2 lbs). Magazines of 5, 10 and 25 rounds.

This model was to have substituted for the machine rifle in specialist paratroop and Alpine units.

A rifle with a ten-round, in-stock magazine was compared with one fitted with a wider receiver which allowed the use of the detachable Model 24-29 machine rifle box magazine, retained by a catch located on the right side of the feeding ramp. It was decided that the autoloading rifle with the detachable magazine could substitute for the machinegun (or machine rifle) in units which were not so equipped, such as ski-scouts (Alpine riflemen) and paratroops. It was also anticipated that a folding-stock version (with a stock of hollow cast aluminum, like the MAS 36 CR 39) would be manufactured for these special units. A light folding bipod was requested, so that men with the magazine- equipped *FA MAS* (MAS auto[loading] rifle) would not use the magazine as a support when firing prone.

The twenty-five round machine rifle magazine could not be used in many critical situations, so five- and ten-round magazines were also developed. These made the rifle easier to handle (and were retained in the later MAS 44).

The MAS 40 with detachable magazine was tested at La Courtine Camp on June 8, 1940, without doubt a little late because on that day the Germans arrived at the gates of Paris.

Needless to say, the events which followed did not allow for manufacture of the MAS 40 or any other rifle. It would be four long, hard years before the study of this or any other model could be resumed.

112. Left side closeup of the action of the *Type SE* (Service d'Etudes) *1938-39 à Chargeur* serial no 4, showing markings.

A MAS 40 with detachable magazine was tested at La Courtine Camp on June 8, 1940, the day the German Army reached the gates of Paris.

A Last Conversion Kit: the Snabb 38

Our study would be incomplete if it did not include the presence of three Swedish Mausers transformed into autoloading rifles by means of a "kit" invented by a Mr Snabb.

The testing took place in January, 1939 at the Technical Testing Establishment in Versailles, in the presence of the inventor.

The Snabb system took gas at the muzzle through a sleeve at the end of the barrel. A cylinder, placed underneath the barrel, moved the bolt.

The invention was judged interesting and was eventually applied to the conversion of the bolt-action Model 1907-15 into the M34 rifle.

Chapter Six

First in Combat: the MAS 44

Waiting Out the War

The fall of France in June, 1940 and four years of German occupation forcefully stopped the development of all weapons by the French government.

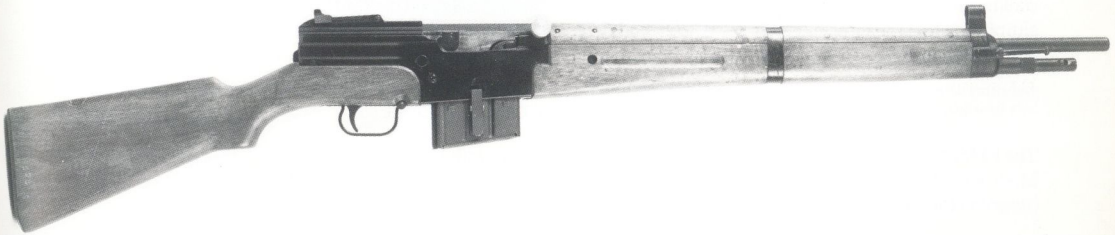
During the summer of 1944, under joint action with Allied troops, and with the aid of French resistance movements, the Free French Forces (FFL; the *Forces Françaises Libres*) began to force the occupying Germans to retreat or surrender. Slowly, France regained her freedom.

The St-Etienne region was liberated in September, 1944, whereupon, as noted earlier, the region's *Maquis* (resistance fighters) ransacked the State arsenal, arming themselves with every weapon they could find, including many priceless prototypes which were never seen again!

Once the euphoria of liberation was over, it was necessary to restore order. The General Staff of the FFL in the Department of the Loire published a request inviting those who had MAS 40 automatic rifles to turn them in quickly so as to exchange them for new MAS 36 rifles. It is unknown if this circular had any influence, or if any rifles were in fact recovered, as due to the secrecy, not to say deadly rivalry, which characterised the operations of the various factions, it was not easy to contact them. Even if a union of resistance movements existed in theory, they were far from being united in the field. The two most important resistance organisations were the *Armée Secrète* (which was Gaullist) and the *Francs Tireurs et Partisans* (which was communist).

It was planned to start manufacturing the MAS 40 rifle in November, 1944, but first it was decided to modify the receiver itself to accept a box magazine with a ten- or fifteen-round capacity. The following month the model with the ten-round magazine was accepted, and it was decided to manufacture 10,000 units monthly, by asking private industry to participate if necessary.

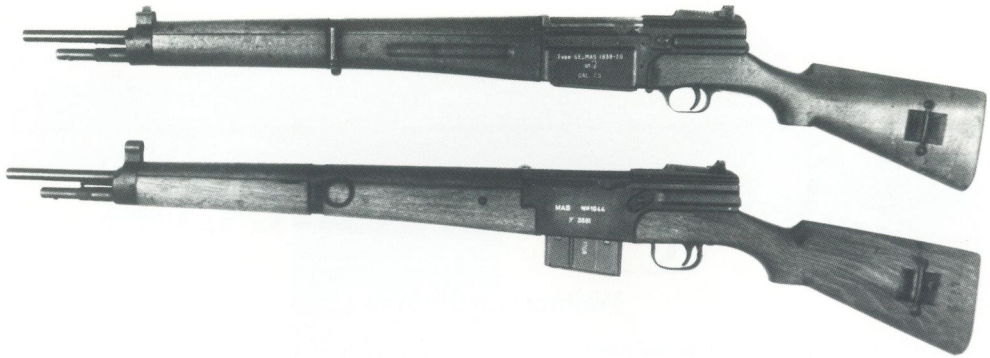
Adoption at Last



113. Right side view of the MAS 44 rifle. Overall length 1.075m (42.3"); length with bayonet fixeed 1.345m (53"); barrel length .580m (22.8"); weight 3.900kg (8.6 lbs). Magazine capacity 10 rounds.

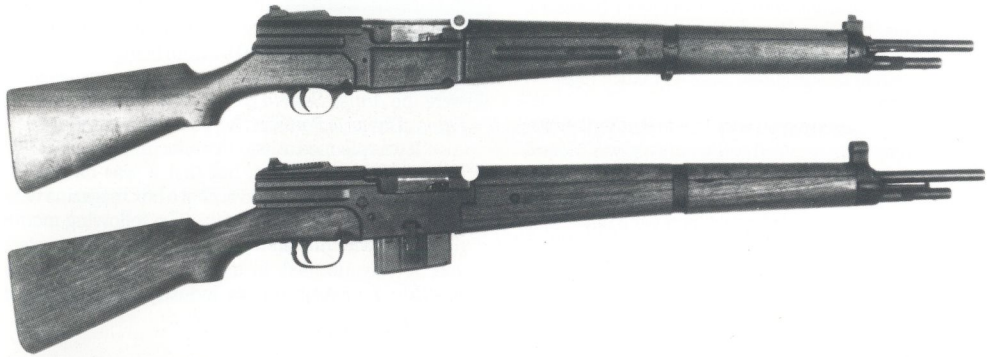
On January 11, 1945, the Ministry of Armament adopted the new rifle under the name *Fusil Automatique* MAS 44, fixing its production at a rate of 50,000 monthly. However, World War II had ended in Europe before the first MAS 44 rifle was produced: the provisional technical data was edited in April, 1945.

During a 6,000-round endurance test with two MAS 44 rifles in 1946, only 0.5% stoppages occurred.



114 (above and below). Comparisons between the MAS 1938-39 and the MAS 1944.

Above: right side views, MAS 1938-39 on top.
Below: left side views, MAS 1938-39 on top.
courtesy Robert S Eddy III



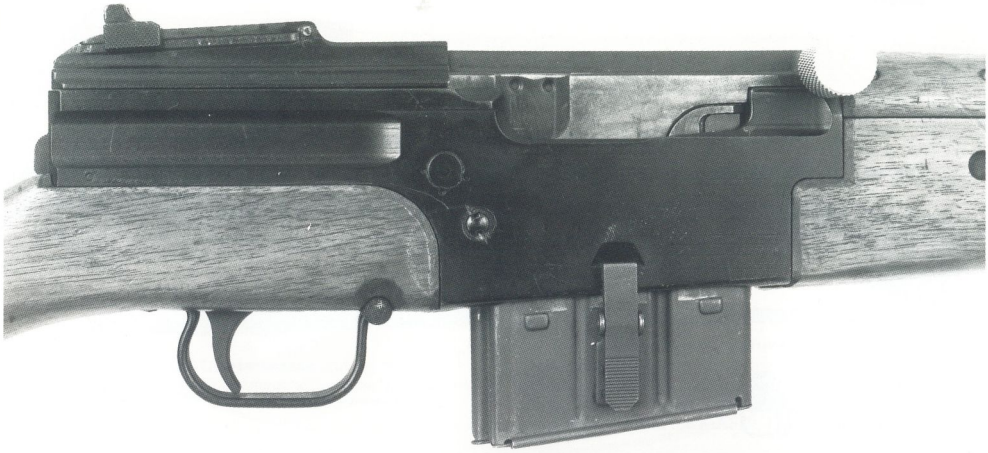
Before proceeding with troop trials, it was requested that the cocking handle be reinforced, that the cocking handle button be made of nylon instead of aluminum, that the ramp angles of the bolt be modified, and that each magazine be fitted with its own clamp-type catch instead of relying on elastic fasteners in the receiver.

Only 6,200 MAS 44 rifles were produced, delivered mostly to the French Navy which used them to outfit its Marine Commandos in Indochina.

Description of the MAS 44

The MAS 44 is no longer a MAS 40 and yet not quite a MAS 49. Without going into the detailed description (reserved for the definitive MAS 49 in Chapter Seven), the following are the principal characteristics of the MAS 44, the first of the MAS series to be adopted, produced, and used in the field:

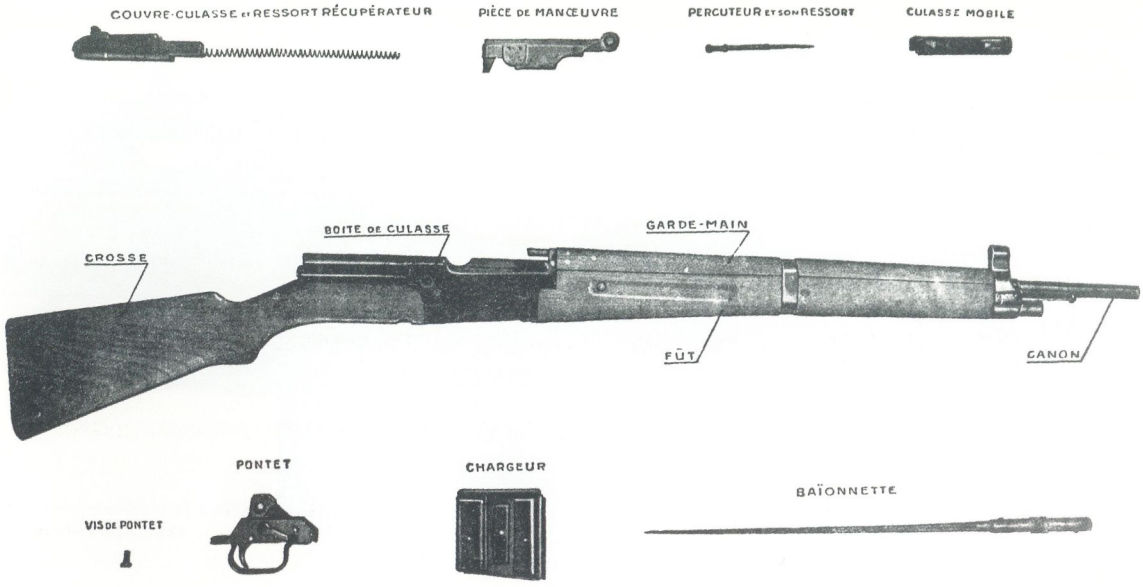
receiver:	plain (not grooved for telescopic sight)
ejector plate:	rectangular, with rounded tips
cocking handle button:	aluminum (prototypes only; nylon on all production rifles)
firing pin:	includes a stop and a rebound spring
bolt carrier side plates:	riveted



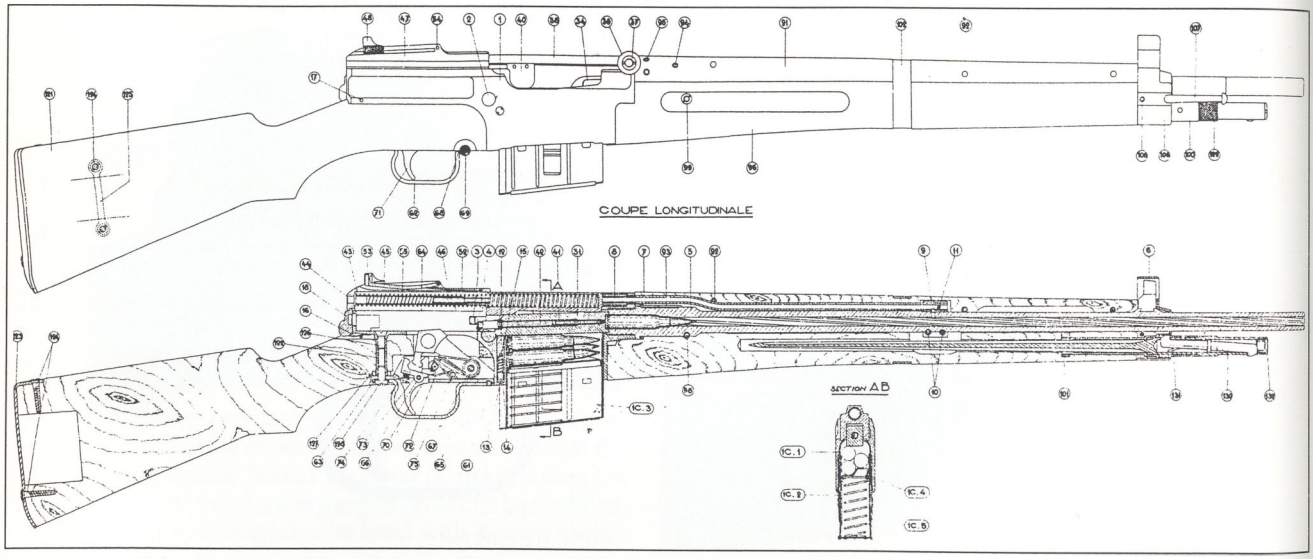
115. Right side closeup of the receiver of the MAS 44. This model was the first to use the detachable 10-shot magazine with integral side-locking magazine catch.

116. Left side closeup of the receiver of MAS 44 serial no 50, showing markings. Note the ejector retaining block, rectangular with rounded edges on this model, and the lightening cut in place of the later telescope mounting dovetail.

magazine attachment:	fixed by two lateral flat springs, forming elastic fasteners which clip onto internal notches within the feeding ramp (prototypes only). Magazines on production MAS 44 rifles were each fitted with the integral release clamp as found on the MAS 49.
rear sight:	identical to that of the MAS 36
front sight:	fixed by dovetail
handguard:	with crosspiece screw
gas cylinder:	forward of the lower band
gas vent:	perpendicular to the barrel



117. The MAS 44, field stripped. courtesy MAS

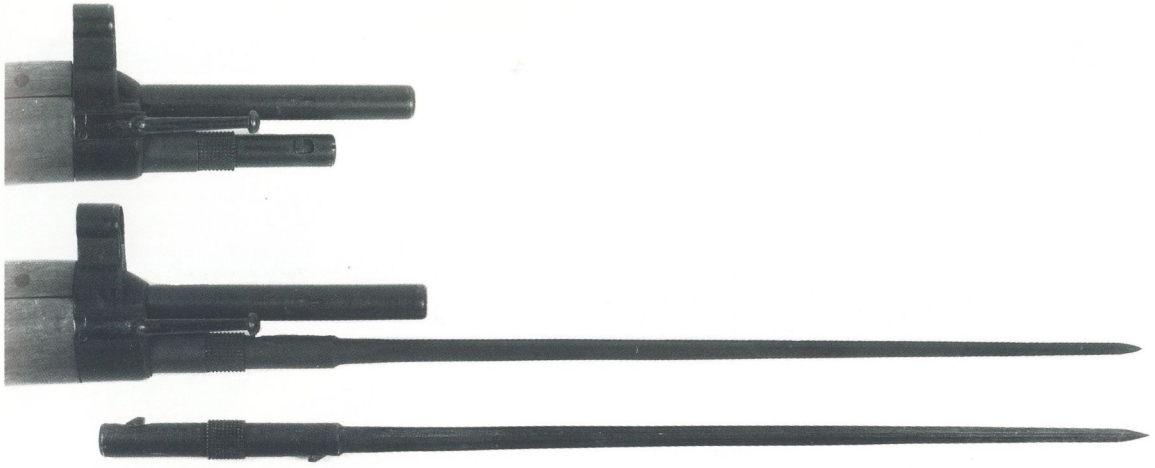


118. Right side views of the MAS 44, with parts numbered to correspond to the following list. Above: outline view. Below: section view.

Nomenclature, *Fusil Automatique* MAS 44

1. receiver
2. bolt
3. ejector stop
4. ejector stop screw
5. barrel
6. front sight
7. gas tube
8. gas tube orifice
9. gas block
10. gas block screw
11. gas tube pin
12. bolt stop
13. bolt stop plug
14. bolt stop spring
15. bolt stop screw
16. bolt cover latch spring
17. bolt cover latch spring pin
18. bolt cover latch
31. bolt
32. ejector
33. ejector pin
34. extractor
35. extractor spring
36. cocking handle

continued at bottom of facing page

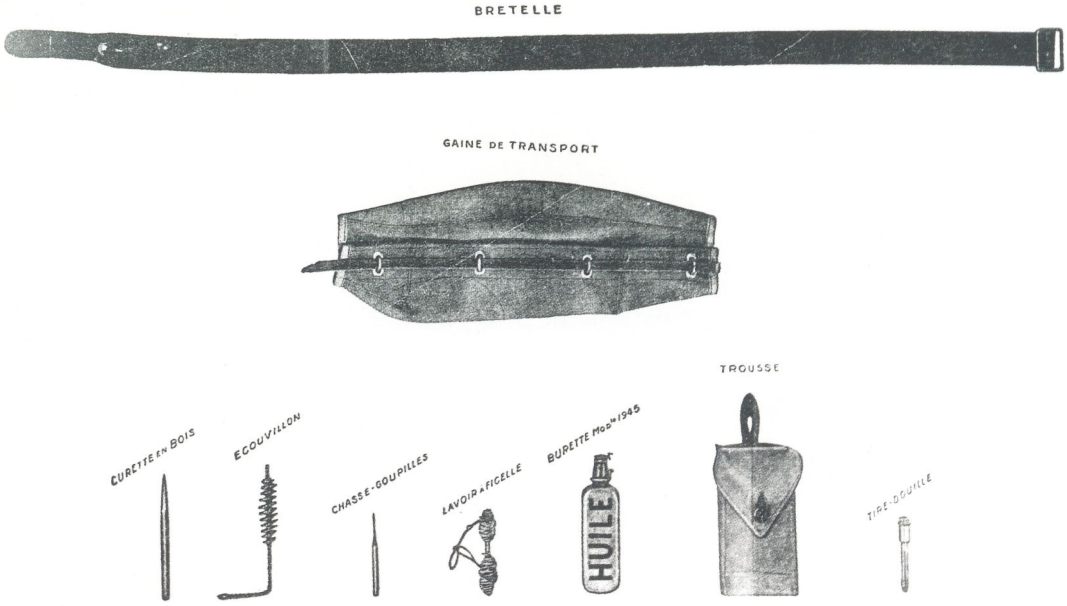


119. Three views of the MAS 44 muzzle and bayonet.
Top: muzzle area with bayonet stowed in permanent housing.
Centre: bayonet reversed (fixed).
Below: bayonet, showing double-ended locking bar and knurled central grip. The cruciform MAS 44 bayonet is identical to that of the MAS 36 bolt-action rifle.

lower band:	with sling ring (as on the MAS 36 made after 1945)
upper band:	pressed steel; supports the bayonet and has a tunnel to protect the front sight
bayonet:	identical to the one on the MAS 36
grenade launcher:	none

118 (continued from previous page).
37. cocking handle nut
38. bolt carrier
39. bolt carrier left side plate
40. bolt carrier right side plate
41. recoil spring
42. firing pin
43. recoil spring guide
44. spring guide shoulder
45. guide rod spring
46. guide rod recoil spring
47. bolt cover
48. sight leaf cursor
49. cursor stop
50. cursor stop spring
51. cursor stop pin
52. sight leaf spring
53. sight leaf
54. sight leaf pin
55. recoil spring
61. trigger housing
62. triggerguard
63. trigger housing washer
64. hammer
65. hammer pin
66. trigger pin
67. hammer spring
68. safety lever
69. safety lever plunger
70. safety
71. trigger
72. trigger spring
73. sear
74. sear spring
75. trigger spring pin
91. handguard
92. handguard reinforcing peg (3)
93. handguard liner
94. handguard liner rivets
95. handguard washer
96. forearm
98. forearm screw
99. forearm screw nut
100. bayonet support
101. bayonet support screw
102. lower band
103. sling ring
104. lower band bushing
105. lower band screw
106. front band
107. stacking rod
108. front band screw
121. stock
122. triggerguard screw bushing
123. buttplate
124. buttplate and sling bar screws
125. sling bar
126. buttstock screws
127. stock bushing nut
128. triggerguard screw
129. bayonet
130. bolt stop lever
131. bolt stop lever spring
132. handle plug
133. sling
134. sling buckle
135. sling button

courtesy CAA



120. MAS 44 individual issue accessories. From top, left to right:
- leather sling, Model 1936
- cloth receiver transport cover
- wooden cleaning pick
- 'L'-shaped wire chamber brush
- pin punch
- pullthrough
- oil can, Model 1945
- tool bag
- broken shell extractor

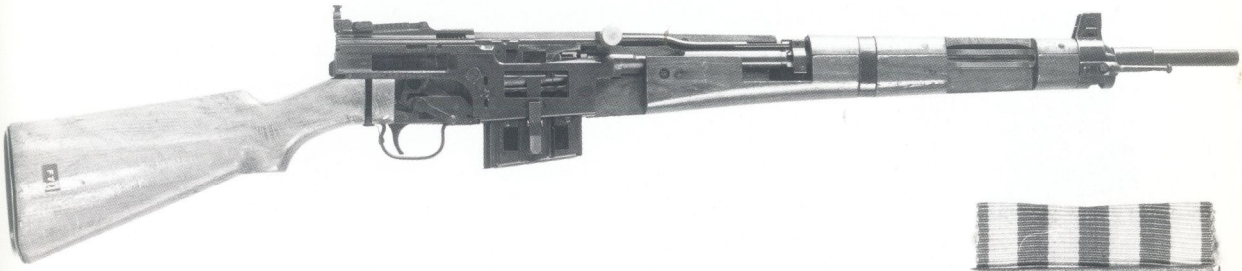
courtesy MAS

121 (left). French Marines, shown here saluting with their MAS 44 rifles during a ceremonial parade. Note the cartridge pouches, originally issued with the Lebel 8x50R rifle. courtesy D R

122. Beret insignia of the French Marine Commandos, derived from the insignia of the famous British "Green Berets". The Marine Commandos fought in France in the D-Day invasion, and served as Intervention troops in Indochina and Algeria.

123. The MAS 44 in service in France, circa 1950.

Honed in Saigon: the MAS 44 A



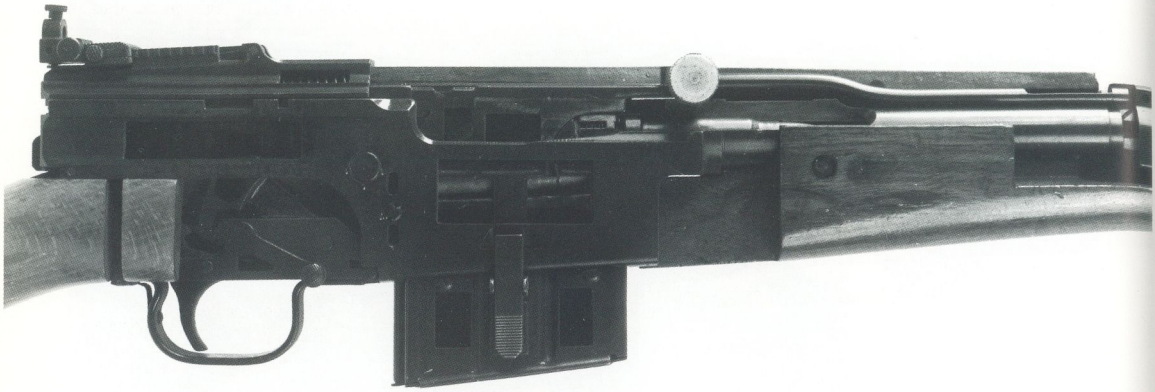
124. Right side view of the MAS 44A. This example has been cut away to serve as an instructional tool.
Characteristics of the MAS 44A: overall length 1.075m (42.3"); barrel length: .580m (22.8")' weight 3.750kg (8.26 lbs). Magazine capacity 10 rounds.

Service use of the MAS 44 by the French Expeditionary Force in Indochina revealed certain imperfections, which were remedied in a new experimental model called the MAS 44 Type A. The programme of October 20, 1946 stated the following final specifications for an autoloading rifle in calibre 7.5x54mm, to be derived from the MAS 44:

- precision at 200m must be H + W of 30mm (1.18")
- adjustable rear sight
- possibility of adapting a telescopic sight with a practical range of 600m
- integral grenade launching device
- rubber buttplate
- elimination of the bayonet
- creation of a folding stock model for alpine and airborne troops.

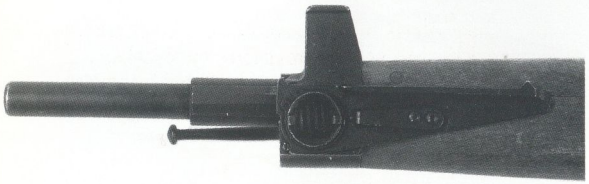
The resulting variant of the MAS 44 was named the MAS 44 Type A. As shown below, the MAS 44 A has a great number of similarities with the later, final design, the MAS 49:

125 (right). The medal struck to commemorate French service in Indochina.



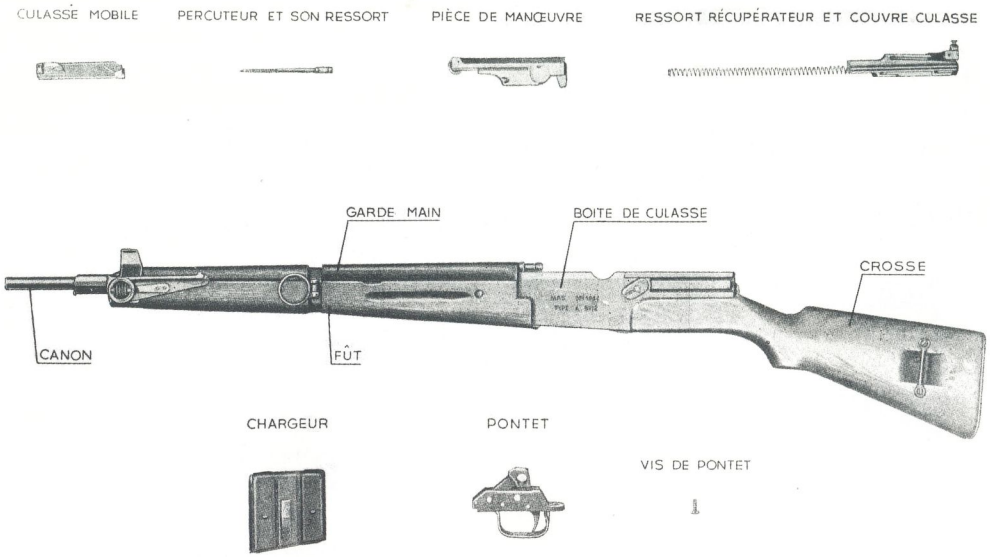
126. Right side closeup of the MAS 44 instructional cutaway. The gas *adducteur* (tube) on top of the barrel can clearly be seen .

127. Left side closeup of MAS 44 A serial no 46. Compare with fig 116: note the horizontal dovetail on the side of the receiver (below the micrometer rear sight). Every MAS rifle from this time forward was equipped for attachment of the telescopic sight.



128 (left). Left side closeup of the muzzle area of the MAS 44 A, showing the integral grenade launcher with grenade sight folded.

The launcher tube is adjustable for grenade range by means of the worm gear, which is 'thumbed' to advance or retract the grenade stop.



129. The MAS 44 A, field stripped into major components. From top, left to right: bolt, firing pin and spring, bolt carrier, recoil spring and receiver cover; barrel, forestock, handguard, receiver, buttstock; magazine, trigger group, trigger group screw. courtesy MAS

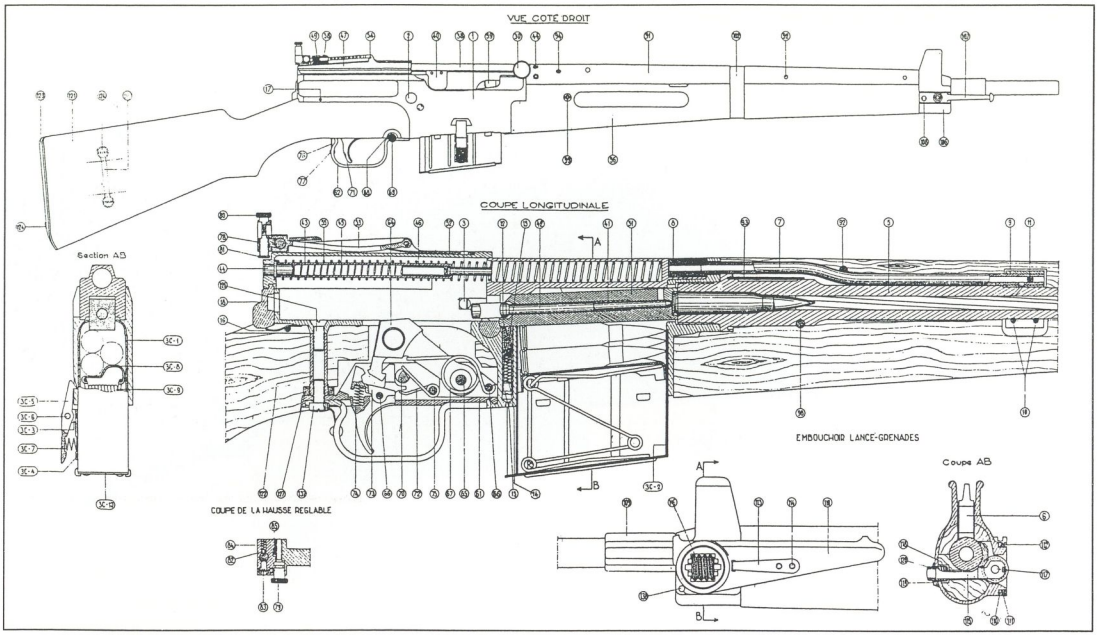
Characteristics, MAS 44 Type A

receiver:	grooved for telescopic sight (like the MAS49)
ejector plate:	rectangular with rounded tips (like the MAS 44)
firing pin:	has a stop and a rebound spring (like the MAS 44)
bolt carrier side plates:	dovetailed; can be dismantled
magazine:	fixed by a lateral clamp (like the MAS 49)
rear sight:	adjustable in height by serrations; in direction by a screw
front sight:	dovetailed and soldered
handguard:	with riveted liners
gas block:	placed behind the lower band (like the MAS 49)
gas vent:	forms a sharp angle to the barrel (like the MAS 49)
lower band:	with a sling ring (like the MAS 49)
upper band:	machined steel with front sight protector ears, holding the grenade launching device
bayonet:	none
grenade launcher:	similar but not identical to the one on the MAS 49

Trials of the MAS 44 A were begun in July, 1947. Grenade launchings revealed that the rifle worked conveniently, but the bolt opened and ejected the launching cartridge. This affected the range of the projectile.

Starting on December 1948, the MAS 44 A was tested with the APX L 806 telescopic sight.

The MAS 44 A can be considered the pre-series version of the MAS 49. Its provisional technical data is dated October, 1948. Forty rifles were tested in infantry units in July, 1949.



130. Views of the MAS 44 A with parts numbered to correspond to the following *list*.
Above: right side outline view.
Below: closeup section view of receiver and chamber area, and cross sections. Note the direct gas system (in use since 1922), and the dropping bolt (first used in the MAT 1926).
courtesy MAS

Nomenclature: *Fusil Automatique* MAS 44 Type A

1. Receiver
2. Bolt rest/Headspace pin
3. Ejector stop
4. Ejector stop screw
5. Barrel
6. Front sight
7. Gas tube
8. Gas tube orifice
9. Gas sleeve
10. Gas sleeve screw
11. Gas tube pin
12. Bolt stop
13. Bolt stop plug
14. Bolt stop spring
15. Bolt stop screw
16. Bolt cover latch spring
17. Bolt cover latch spring pin
18. Bolt cover latch
28. Cocking handle pin
29. Cocking handle washer
30. Cocking handle plunger
31. Bolt
33. Ejector pin
38. Bolt carrier
39. Bolt carrier left side plate
40. Bolt carrier right sideplate
41. Rebound spring
42. Firing pin
43. Recoil spring guide
44. Spring guide shoulder
45. Guide rod spring
46. Guide rod recoil spring
47. Bolt cover
49. Cursor stop
50. Cursor stop spring
51. Cursor stop pin
52. Sight leaf spring
53. Sight leaf
54. Sight leaf pin
55. Recoil spring
57. Ejector
58. Sight cursor
59. Extractor
60. Extractor spring
61. Trigger housing
62. Triggerguard
64. Hammer
65. Hammer pin
66. Trigger pin
67. Hammer spring
68. Safety lever
69. Safety lever plunger
70. Safety
71. Trigger
72. Trigger spring
73. Sear
74. Sear spring
75. Trigger sear spring
76. Triggerguard screw clamping bridle
77. Triggerguard screw bridle rivet
78. Peepsight base
79. Windage screw
80. Elevation screw
81. Peepsight stop washer
82. Bearing
83. Windage screw spring
84. Peepsight spring

continued on bottom of following page

Two Evolutionary Dead Ends: the MAS 44 B and MAS 44 C

131. Left side views of one of the two experimental evolutionary dead ends described in the text.
Above: the MAS 44 Type B.

The MAS 44 B was a further variant of the MAS 44 with a peep sight (no 1, above) located at the rear of the barrel, adjustable for windage and elevation. The necessarily higher front sight (2) is mounted on a collar at the tip of the barrel. This rifle can launch grenades using a detachable sleeve (5) for which it has a gas vent closing device.

Below: the MAS 44 Type C with grenade attachment fixed.
courtesy CAA

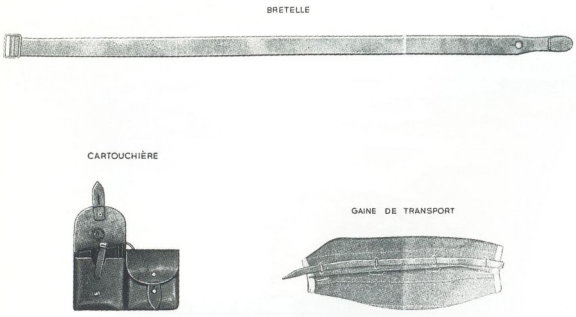
The MAS 44 C was very similar to the MAS 44, but with a different receiver cover and modified triggerguard attachment.

The MAS 44 B and MAS 44 C were tested in October, 1947. A number of minor incidents showed up during the tests, and it was decided that the performance did not merit retaining these two variants.

130 (continued from previous page).
85. Peepsight base stop pin
91. Handguard
92. Handguard reinforcing peg
93. Handguard liner
94. Handguard liner rivet
96. Forestock
98. Forestock screw
99. Forestock screw nut
102. Lower band
103. Lower band ring
105. Lower band screw
106. Upper band
107. Stacking rod
108. Upper band screw
109. Sliding range scale
110. Grenade sight
111. Spring washer
112. Stop washer
113. Grenade sight stop spring
114. Stop spring rivet
115. Worm screw stirrup
116. Worm screw
117. Worm screw pin
118. Stirrup spring
119. Spring housing
120. Stirrup plug
121. Buttstock
122. Triggerguard screw bushing
123. Buttplate
124. Buttplate and sling slide screw
125. Sling bar
126. Buttstock screws
127. Buttstock nut bushing
137. Trigger housing screw
138. Grenade sight stop pin
3C. Magazine
3C1. Magazine body
3C2. Reinforcement plate
3C3. Cover
3C4. Cover rivet
3C5. Lever
3C6. Lever pin
3C7. Lever spring
3C8. Follower
3C9. Follower spring
3C10. Magazine bottom

courtesy MAS

MAS 44 A Accessories



132. Accessories for the MAS 44 A. From top, left to right: sling; cartridge pouch; receiver cover. courtesy MAS

The following accessories were issued on an individual basis with the MAS 44 A rifle:

- leather sling, Model 1936
- cloth transport bag
- wooden cleaning pick
- brush
- pin punch
- pullthrough
- oil can, Model 1945
- bag
- case extractor

Superb Versatility: Area Fire Plus Sniper Capability in Every MAS 44 A

As shown, on the MAS 44A a device was added from which the Model 1948 grenade could be launched. This grenade (fig 151) was simply a derivation of the one launched by the 50mm Model 1937 launcher. A similar adaptation was done on the bolt-action MAS 36 LG 48.

A telescopic sight can also be attached to the MAS 44 Type A. This way, any rifle could become a sniper rifle or a grenadier's rifle, and thus perform one of two special functions within a combat group.

133. The Model 37 50mm grenade launcher. The projectile for this launcher was used as the basis of development for the anti-personnel grenade *Modèle* 1948, fired off the integral launchers of the MAS 44 Type A and MAS 49.

With the issue of these truly multi-purpose rifles, the ungainly Model 37 grenade launcher could be dispensed with on missions where weight and space were at a premium, with little or no loss in area fire capability.

For All That: a Truncated Career

When one has witnessed the stresses that are imposed on a rifle when launching grenades, one remains bewildered that the grenade-capable MAS 44A could possibly remain effective as a sniper rifle. The MAS 44 A was a tough, proven performer, capable of absorbing incredible abuse while remaining remarkably accurate.

Nevertheless, no rifle can be all things to all men (although many have tried to design such a utopian arm), and rifles assigned to snipers in the field were not normally called upon to launch grenades.

The MAS 44 Type A was field-tested in 1947-48, but was rapidly replaced by the MAS 49.

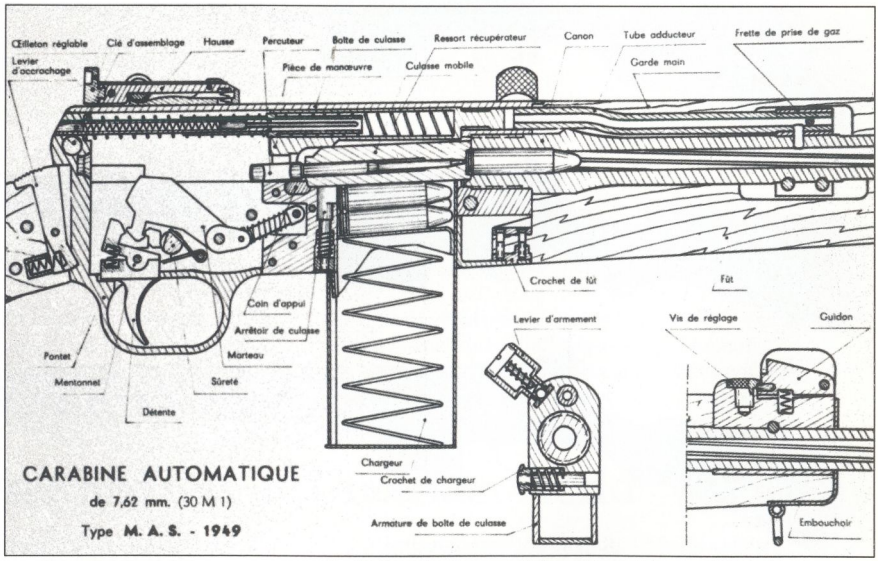
First Hints of Obsolescence: the *Carabine Automatique*

134. Right side views of the MAS 1949 *Carabine automatique* with *crosse repliable* (folding stock), showing stock open (above) and folded (below). This model was produced for trials in two "intermediate" calibres: French 7.65x35mm and .30 US Carbine (7.62x33mm).

The particulars of the .30 Carbine version, shown here, are as follows: length .920m (36.2"); length with buttstock folded .600m (23.6"); barrel length 450mm (17.7"); weight 2.880kg (6.35 lbs). Magazine capacity 15 rounds (.30 Carbine), 14 rounds (7.65x35mm). photo courtesy MAS

Other programmes bearing fruit at this time included a new type of weapon called the "automatic carbine" (*carabine automatique*), with range and performance characteristics somewhere between those of the WWII German MP44 and the US M2 Carbine. As discussed in the author's *French Assault Rifles*, to be published by Histoire et Collections, numerous examples of intermediate- range "automatic carbines" were produced by all three State arsenals.

The MAS entry, pictured here, shows a distinct "family resemblance": the dropping bolt and the direct gas system, trademarks of MAS *fusils automatiques* since the 1920s, are unmistakeable.



135. Right side closeup of the action of the .30 US Carbine calibre MAS 1949 automatic carbine, sectioned to show components. The dropping bolt and gas *adducteur* can clearly be seen. courtesy MAS

136. By the time the MAS 49 was adopted, World War II had been over for four years. Ironically the last to be adopted and produced, the lineage of the MAS 49 was decidedly the longest of any of the rifles shown here. Features embodied in every one of the above rifles were pioneered in French autoloaders. From top:

- US M1 Garand, adopted in 1936. The staggered *en bloc* clip and feeding system of the M1 owes much to that of the B8 Chezaud rifle and the RSC (M1917). France received 232,499 M1s as US aid between 1943 and 1964.
- Russian Tokarev SVT 38. Tilting bolt and carrier.
- Swedish Ljungmann AG m/42 b. Tilting bolt and carrier; Rossignol (direct) gas system.
- German G43 (K43), successor to the G41(W). Retractable bolt lugs, as on the Rossignol (ENT1901).
- Belgian FN49. Tilting bolt and carrier. Produced in 7mm, 7.65mm, 7.9mm and .30-06.
- MAS 49, calibre 7.5x54mm.

Chapter Seven

The Home Stretch: the MAS 49

137. Two views of the MAS 49 rifle, the result of over 30 years of French autoloading rifle research. Adoption of the MAS 49 did not mean a wholesale abandonment of bolt-action rifles, however, as only 20,600 MAS 49s were produced—one fourth as many as were made of the *Modèle* 1917 in WWI.

Above: right side view.

Below: left side view. Like the MAS 44 A, the MAS 49 was fitted with a built-in grenade launcher, but had no bayonet.

As a result of the field trials and testing done by the Technical Sections of the State arsenals, the MAS 44 and the MAS 44 Type A were further modernised and the resulting arm was adopted on July 12, 1949 as the MAS 49. It is with the MAS 49 that for the first time the expression "semi-automatic rifle" appears in the nomenclature of the French Army. As mentioned, this term was adopted in February, 1952; previously French autoloaders were called *fusils automatiques* ("automatic" rifles).

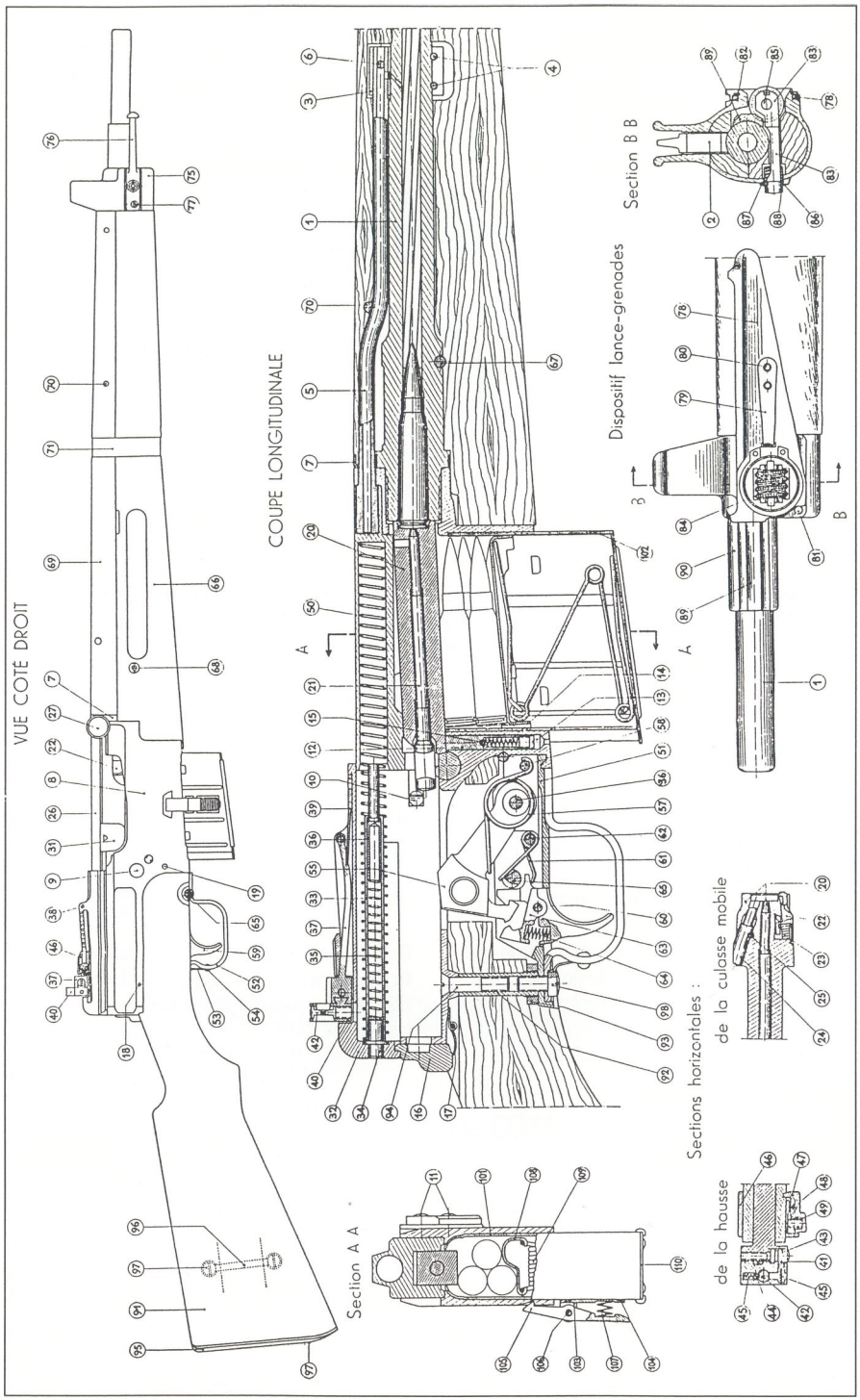
Launched Into an Uncertain World

The new rifle was basically a MAS 44 Type A with a modified rear sight, ejector plate, firing pin, grenade launching device and other small details.

Its manufacture began rather hesitantly, because other programmes were also producing interesting prototypes which were being studied:

- automatic carbines in 7.65x35mm and in .30 M1 Carbine calibre
- semi-automatic carbines in the same calibres
- semi-automatic rifles in .30-06
- assault rifles in 7.5x54mm and then in 7.62mm T65 (future 7.62 NATO)

Alas, although the French Army had defined its requirements well , it could not decide what to choose.


VUE COTÉ DROIT
COUPE LONGITUDINALE
Dispositif lance-grenades
Section B B
Section A A
Sections horizontales :
de la hausse
de la culasse mobile

One of the conceptions on which the European Defense Community was founded was the standardisation of weaponry among its members. NATO did not yet exist, and France was still counting heavily on her American ally: the US furnished a great part of the equipment used by French troops during the Indochina conflict. The State arsenals were ready to respond, but people in high places were not issuing coherent orders.

138 (facing page). Several views of the MAS 49.
Above: right side outline. Parts are identified below.
Centre: section through A - A showing bolt and cartridges; closeup cutaway of the central portion showing rifle ready to fire with cartridge in chamber and hammer cocked.
Below: top view of rear sight; top view of bolt showing ejector; left side view of grenade launcher; section through barrel, launcher and front sight at B - B.

Nomenclature, MAS 49 Rifle

1. Barrel
2. Front sight
3. Gas sleeve
4. Gas sleeve screw
5. Gas tube
6. Gas tube pin
7. Handguard collar
8. Receiver
9. Bolt rest/Headspace pin
10. Ejector stop
11. Ejector stop screw
12. Bolt stop
13. Bolt stop plug
14. Bolt stop spring
15. Bolt stop screw
16. Bolt cover latch
17. Bolt cover latch spring
18. Bolt cover latch spring pin
19. Triggerguard stop pin
20. Bolt
21. Firing pin
22. Extractor
23. Extractor spring
24. Ejector
25. Ejector pin
26. Bolt carrier
27. Cocking handle
28. Cocking handle pin
29. Cocking handle washer
30. Bolt carrier left sideplate
31. Bolt carrier right sideplate
32. Bolt cover
33. Recoil spring guide
34. Recoil spring guide shoulder
35. Guide rod spring
36. Guide rod recoil spring
37. Sight leaf
38. Sight leaf pin
39. Sight leaf spring
40. Peepsight base
41. Peepsight base stop pin
42. Peepsight height adjustment screw
43. Peepsight windage adjustment screw
44. Ball bearing screw stop (2)
45. Ball bearing springs (2)
46. Sight cursor
47. Cursor stop
48. Cursor stop pin
49. Cursor stop spring
50. Recoil spring
51. Triggerguard housing
52. Triggerguard
53. Triggerguard screw clamping bridle
54. Triggerguard screw bridle rivet
55. Hammer
56. Hammer pin
57. Hammer spring
58. Hammer spring catch pin
59. Trigger
60. Trigger pin
61. Trigger spring
62. Trigger spring pin
63. Sear
64. Sear spring
65. Safety
66. Forearm
67. Forearm screw
68. Forearm nut
69. Handguard
70. Handguard reinforcing peg (3)
71. Lower band
72. Lower band ring
73. Lower band screw
74. Lower band bushing
75. Upper band
76. Stacking rod
77. Upper band screw
78. Grenade sight
79. Grenade sight stop spring
80. Grenade sight spring rivet
81. Grenade sight stop pin
82. Stop circlips
83. Support stirrup and plunger
84. Worm screw
85. Worm screw pin
86. Spring cage
87. Plunger spring
88. Plunger plug
89. Sliding range scale
90. Grenade stop sleeve
91. Buttstock
92. Triggerguard screw bushing
93. Bushing nut
94. Buttstock screw
95. Buttplate
96. Sling bar
97. Buttplate and sling bar screw (4)
98. Triggerguard screw
101. Magazine body
102. Magazine reinforcement
103. Cover
104. Cover rivets (3)
105. Lever
106. Lever pin
107. Lever Spring
108. Follower
109. Follower spring
110. Magazine bottom plate

document MAS

Some Facts About the MAS 49

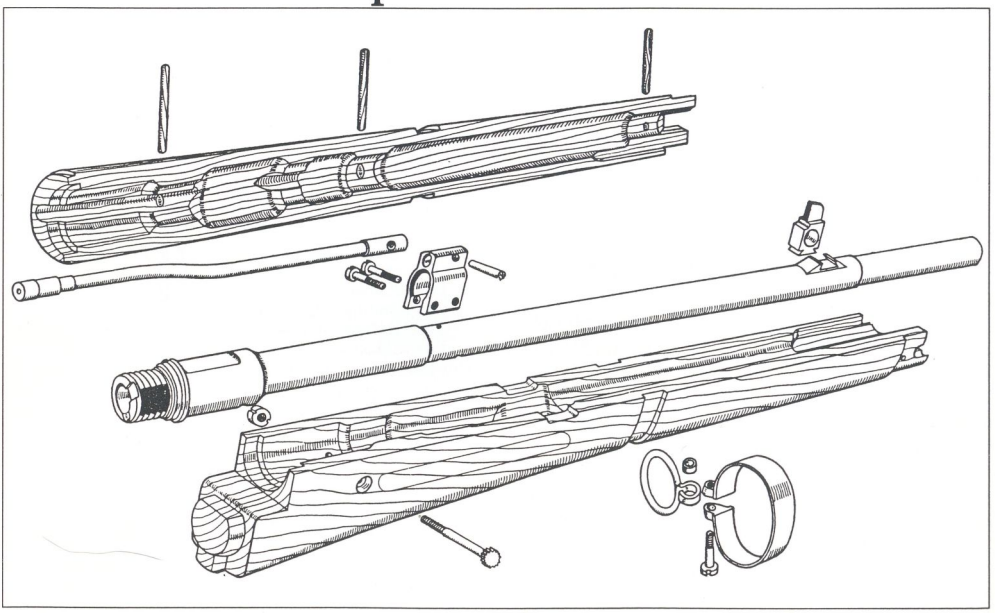
The MAS 49 was the result of work carried on since the development of the rear-locking MAS 1928, by the Department of Studies at *Manufacture Nationale d'Armes de St-Etienne* (MAS). Because of this "team effort", no one person can be specified as the inventor. No patent was ever requested to cover the design details.

Only 20,600 MAS 49 rifles were manufactured, for the Army and Navy. The MAS 49 was *the* rifle for the sniper and the light infantry grenadier. It was used alongside other weapons before it was replaced—in principle at least—by the MAS 49-56. It should have been withdrawn from service in 1972, but in the 80's, when the new FAMAS assault rifle in 5.56mm was first issued, certain artillery regiments still used MAS 49s. The author saw them used in June, 1992 during the DOT (*Défense Opérationelle du Territoire*; National Operational Defense) *ALLIANCE* 92 exercise, organised by the *Gendarmerie* Reserves (wherein reserve and *Gendarmerie* units were mobilised to search for "infiltrated enemies" and protect certain vital points around the nation. On January 1, 1993, the MAS 49 was still inscribed in the Equipment Strength Chart in time of Peace (*Tableau d'Effectif des Dotations en temps de Paix*; TEDP) and in time of War (*Tableau d'Effectif des Dotations en temps de Guerre*; TEDG) of certain Military Defence Districts (*Circonscriptions Militaires de Défense;* CMD).

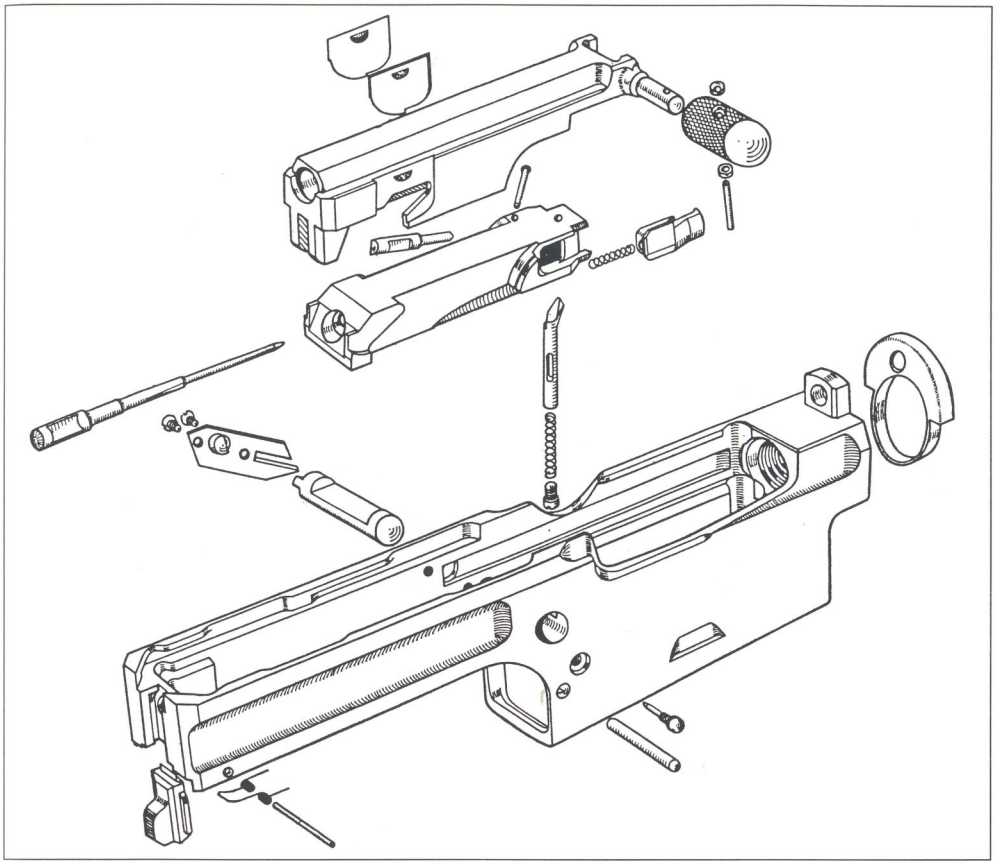
When the MAS 49 was issued it cost 23,000 Francs (price on January 1, 1951), or around 2,500 Francs of 1993, which is about US$500. In comparison, at the same time the Department of Materiel gave the following figures for other weapons (in 1951 Francs):

Lebel Model 1886-93	12,600
Model 1907-15 or Model 1916	12,600
Model 1892 or 1916 musket	8,000
Model 1924-29 machine rifle	83,200
Model 1935 A pistol	10,760
Model 1935 S pistol	8,090
MAS 45 carbine	14,900

Description of the MAS 49



139. Exploded view of the MAS 49 barrel group, showing handguard reinforcement pegs (top) and details of gas system assembly, forestock and front sight. document MAT 1207



140. Exploded views of the receiver and bolt groups of the MAS 49.
Note the dovetailed bolt carrier sideplates, and the absence of a firing pin spring. document MAT 1207

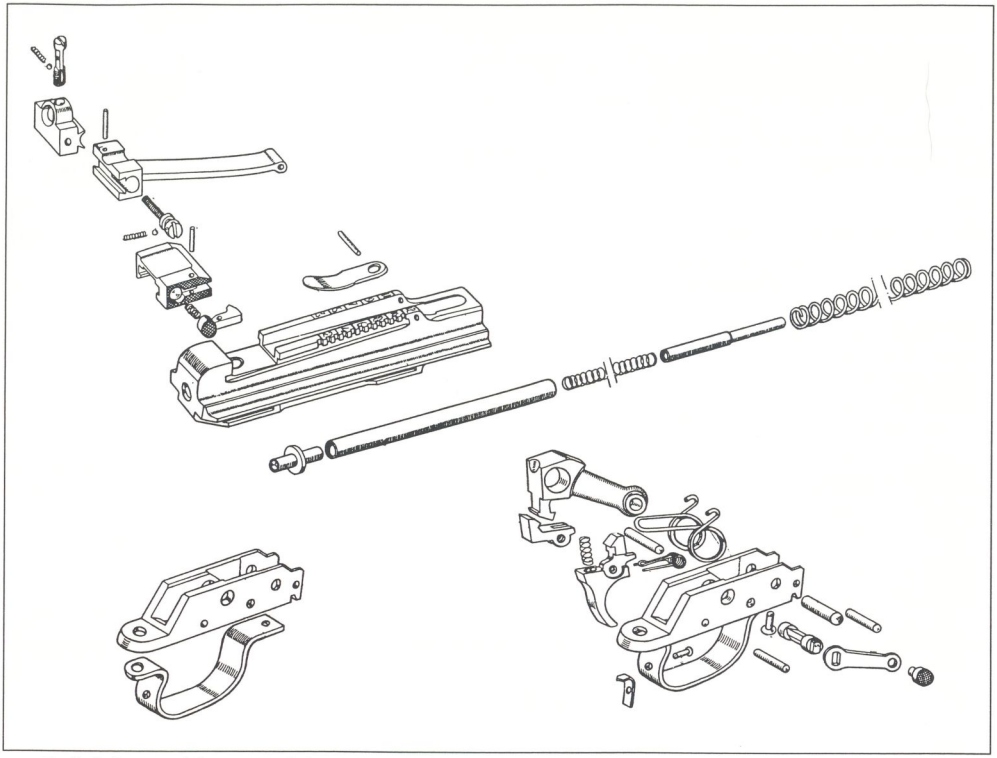
The barrel is a cylindrical tube with four attachment slots, bored to 7.5mm and screwed into the receiver. It has four grooves to the left with a twist of 270mm (10.6"). The gas port bushing, affixed by two screws, is one-third the barrel's length from the breech. The gas vent is at a sharp angle to the barrel.

The simple gas tube is located on top of the barrel, with a slight bent midway to clear the breech. Its forward end is attached to the gas block by a pin. At the rear it emerges through the receiver, directly into a blind hole in the bolt carrier. This arrangement, invented by Rossignol in 1901 and used on MAS prototypes since 1922, was later copied on the Swedish Ljungman AG m/42 b and its clone the Egyptian Hakim, and also on the US ArmaLite AR-10 and AR-15 (M16) rifles.

The receiver, which houses the bolt assembly, is hollow on the bottom to receive the magazine and the firing mechanism. On the upper part are guiding grooves for the bolt cover and bolt assembly.

On the left side of the receiver there is a small elongated plate, fixed by two screws. This is the ejector stop, which also holds the bolt rest (locking shoulder) in place. The locking shoulder is a hardened steel pin with two machined flats, which runs transversely through the receiver, held in place by a notch in the ejector stop plate. It serves to lock and also to headspace the bolt.

To the rear of the ejector stop, a horizontal dovetailed groove is machined into the left hand side of the receiver to accept the telescopic sight. On the opposite



141. Exploded views of the MAS 49 bolt cover group, showing the complex rear peep sight (capable of extremely precise adjustment), and the remarkably compact trigger group. document MAT 1207

side a slight lightening cut is machined, to reduce the weight of the receiver.

The upper part of the receiver is partially covered by the bolt cover, which can be slid forward for removal. The cover is kept in place by a rear lock. The rear sight is mounted on the bolt cover.

The bolt assembly is made up of:

- the bolt carrier, shaped like an inverted 'U'. In front, it has the loading clip guide and a blind hole into which fits the end of the gas tube. This avoids loss of gas (and hence power) when the recoil movement begins. The bolt carrier has on its lower part the bolt unlocking ramps and an inclined locking slope. On its sides are dovetailed cover plates. At the lower rear is a forked lug which holds the firing pin (and will not present it for firing unless the bolt is completely closed). The cocking handle is on the right. It has a checquered cylindrical knob made of black or white nylon.
- the recoil spring, on the same axis, made of wound steel wire. The spring guide base is brazed to the receiver cover.
- the bolt, square in section, is carried in the bolt carrier channel. The claw extractor is on its right, the ejector to the left. Lateral lugs, unlocking ramps and inclined planes coincide with ramps machined into the carrier for locking and unlocking. The lower rear of the bolt serves as its heel and upon tilting down, rests against the bolt support (locking shoulder).
- the very sturdy inertia firing pin goes through the length of the bolt. It does not need a rebound spring.

The rifle is headspaced at the factory by means of interchangeable locking shoulders of varying size. The tilting bolt system and the method of headspacing it, first used on the MAS 1928, was later copied in the Tokarev SVT 38, the Ljungmann AG m/42 b (and the Egyptian Hakim), and the FN49 and FN FAL rifles.

The triggerguard is riveted to the trigger housing, which contains the very ingenious and remarkably compact trigger mechanism, utilising machining, stampings, welding and castings. The housing holds the trigger with its sear and disconnector, the hammer, the safety lever and their three springs, this mechanism being inspired directly by that of the Model 1917 automatic rifle. The hammer spring concept is the same as later used in the AK-47 and M16. The rear disassembly screw has a clamping bridle (riveted to the rear of the triggerguard) which the MAS 44 did not have.

The safety is located to the right of the triggerguard. When it is "off", it is concealed within the stock, showing only its knob. When it is lowered to the "on" position, it blocks the trigger and hampers the introduction of the finger into the guard.

The rear sight base is part of the bolt cover. On the base is pinned a spring-loaded sight leaf assembly with a machined block, hollowed out so as to form a sunshade. A slide provides the elevation to the sight. The ramp is graduated in hundreds of metres from 200 to 1,200m. The rear sight can be adjusted horizontally by means of a graduated micrometer screw, and vertically by rotating the peep sight itself (fig 138 no 42) in its threaded housing by half-turns up or down.

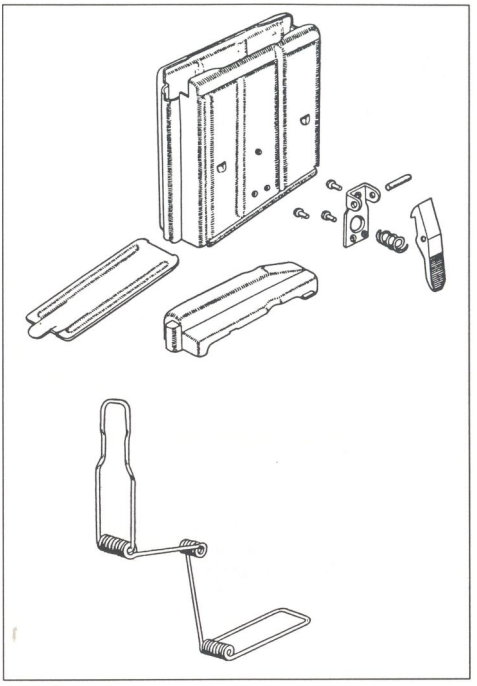
Feeding is by a detachable ten-round box magazine, which staggers cartridges so that the one to be loaded next rests against one of the two magazine lips. An empty magazine can be filled while on the rifle by means of two five-round stripper clips, which are held in a 'U'-shaped guide on the front of the bolt carrier. A thumb notch on the left of the receiver to the rear of the ejection port aids in stripping in the cartridges.

Starting with the MAS 44, the magazines on the MAS series are somewhat unique in that each carries its own magazine latch. This is spring-loaded on the right side, its upper claw fitting into a notch in the right side of the receiver. The magazine has a follower, a 'Z' spring and a bottom plate.

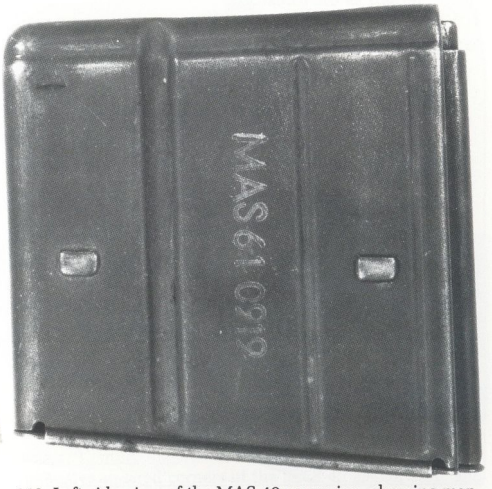
When the last cartridge has been fired, a bolt stop rises to hold the bolt in the rear position. With the bolt open, the bolt stop is held in place by the forward pressure of the bolt. To close the bolt, it is necessary (after having withdrawn or refilled the magazine) to pull the assembly slightly to the rear so that the bolt stop can be withdrawn by spring tension.

The front sight is trapezoidal, dovetailed and then soldered to the barrel.

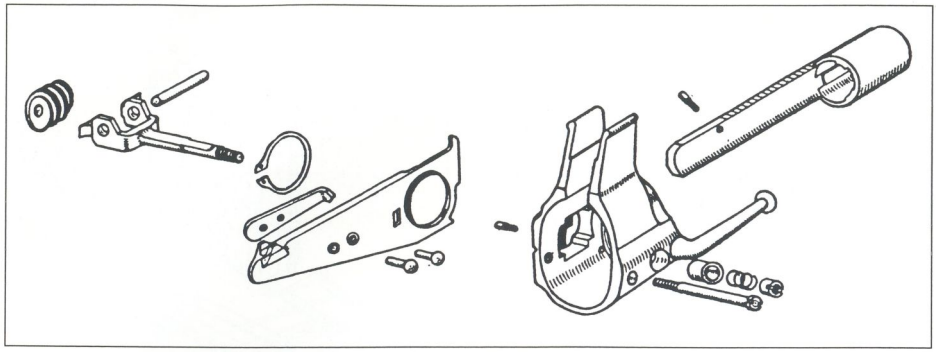
In an admirable move towards weapons commonality, the wood furniture of the MAS 49 is remarkably similar to that of the MAS 36 bolt action rifle:



142. Exploded view of MAS 49 magazine assembly, MAS 49. document MAT 1207



143. Left side view of the MAS 49 magazine, showing manufacturing date stamped in white paint.



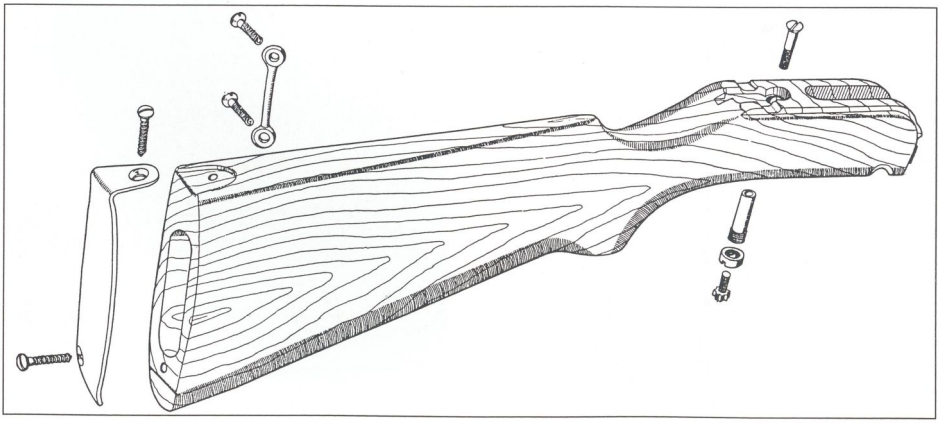
144. Exploded views of the upper band and grenade launcher assembly, MAS 49. document MAT 1207

- the pistol-grip buttstock is encased in the receiver and held in place with a screwed tubular bushing. On the left side is a sling clearance cut, crossed by a vertical sling keeper bar. The stamped-steel buttplate, fixed by two wood screws, covers a lightening slot in the wood (the possibility of stowing the cleaning kit inside this opening was not exploited in France as it was on rifles of other countries, notably the US and Britain).
- the forestock extends to the front sight. It is reinforced at the rear by a transverse screw fixed to a countersunk nut.
- the handguard, reinforced with three glued wooden dowels, covers the barrel to the same length as the forestock.
- The forestock and the handguard are fixed together by the upper and lower bands.

The upper band is machined from solid steel. It holds the stacking rod (welded to the right side), the front sight 'ears' and the grenade launcher assembly.

The grenade launcher uses the same system as the one on the MAS 36 LG 48, a grenade-launching rifle which was reformatted or transformed in the late 1960s, abandoning the Model 1948 anti-personnel grenade. (This led to the elimination of the system from the MAS 49 a few years later.)

The MAS 49 grenade launcher allows aiming and launching of curved-trajectory AP Model 1948 grenades. The launcher assembly is made up of a knurled worm screw by which the range-graduated spigot is adjusted, and a folding grenade sight on the left. This

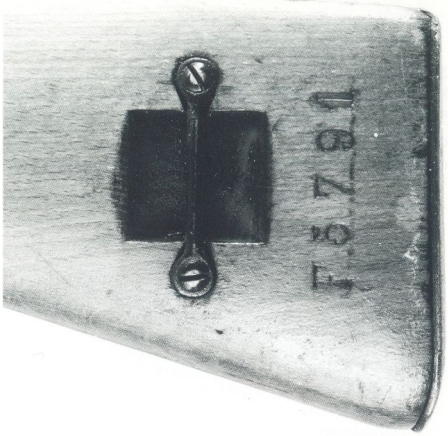


145. Exploded view of the buttstock assembly of the MAS 49. document MAT 1207

has an open 'U' notch and a front sight. During aiming, it is placed on a 45° angle to the barrel axis.

Following the programme of October 20, 1946 the bayonet, present on the MAS 36 and MAS 44, was eliminated on the MAS 44 Type A and the MAS 49.

The major metal parts of the MAS 49 are made from machined steel. The receiver cover and the upper band are cast steel, and the buttplate, triggerguard, magazine, lower band and grenade launcher sight are all stampings. All metal parts are phosphated.



146 (right). Left side closeup of the rear of the buttstock, showing the method of attachment of the sling bar.
Note the serial number, stamped vertically behind the bar.

Characteristics, MAS 49

calibre	7.5mm
ammunition	7.5mm Model 1929 C
total length	1.075m (42.3")
barrel length	0.580m (22.8")
grooves	4 lefthand
twist	270mm (10.6")
sight length	0.650m (25.6")
weight without magazine	3.9kg (8.6 lbs)
magazine weight empty	0.2kg (.44 lb)
magazine weight full	0.43kg (.95 lb)
weight with full magazine	4.33kg (9.5 lbs)
magazine capacity	10 rounds
practical rate of fire	25 rpm
practical range	400m (437 yds)
practical range with telescope	600m (656 yds)
useful range	1,200m (1,312 yds)
maximum range	3,500m (3,828 yds)
muzzle velocity	850m/s (2,789 fps)
muzzle energy	330kgm (2,387 ft lbs)

Markings

147. Left side closeup of receiver of the MAS 49, showing markings.
Compare with the MAS 44 A receiver (fig 127): note the distinctive squared corners of the MAS 49 ejector stop, and the continued placement of the horizontal dovetail for the telescopic sight mount on every rifle.

Markings are found on the left face of the receiver, indicating the model, calibre and serial number (fig 147). On top of the barrel, close to the breech, the name of the manufacturer, the year of manufacture and the code of the steel supplier will be seen. For example:

MAS - 1953 - FY

'FY' is the code for the *Compagnie des Ateliers et Forges de la Loire à Firminy* (the Loire Workshops and Forgings Company, Firminy).

To the rear of the receiver cover is the code of the manufacturer.

Handling the MAS 49

Loading

With the bolt open or closed, affix a loaded magazine:

Take the magazine in the right hand, place it into its opening and push in completely until the claw on the magazine latch engages the notch on the receiver.

Another way of loading is:

Affix an empty magazine, then open the bolt. Place a stripper clip through the front 'U' opening of the bolt carrier and press down hard on the cartridge column, as close as possible to the clip, until all cartridges are introduced into the magazine. Do the same with a second clip. Once ten rounds (two stripper clips) are loaded, the magazine is full.

Withdrawing the Magazine

Pull down on the magazine while pressing on the magazine latch.

Operating the Bolt

With the right hand, grasp the cocking handle and pull it towards the rear. This will cock the hammer and compress the recoil spring.

Release the cocking handle.

If the magazine is loaded, the bolt will go forward under the force of the recoil spring, introducing a cartridge into the chamber.

If the magazine is not in place, the bolt will close on an empty chamber.

If the magazine is in place and is empty, the bolt will not go forward.

To close the bolt on an empty chamber, pull the cocking lever towards the rear and with the left thumb push down on the magazine follower or cartridges, then slowly guide the cocking handle forward so that the bolt can close.

Chambering a Cartridge

With a loaded magazine in place, operate the bolt.

Firing

Place the safety on the "OFF" position, and slowly pull the trigger back. The trigger has a two-stage pull, meaning that the trigger first moves backward with relatively slight pressure and then becomes harder to pull, which lets the shooter know that the hammer is about to be released. Continue to pull the trigger until the rifle fires and then let go.

148. The MAS 49 in Algeria. Along with the bolt-action MAS 36, the MAS 49 was the mainstay of the French military presence in Algeria. photo courtesy J-P Paris

Disarming/Unloading

Make sure that the chamber is empty and the rifle is not loaded.

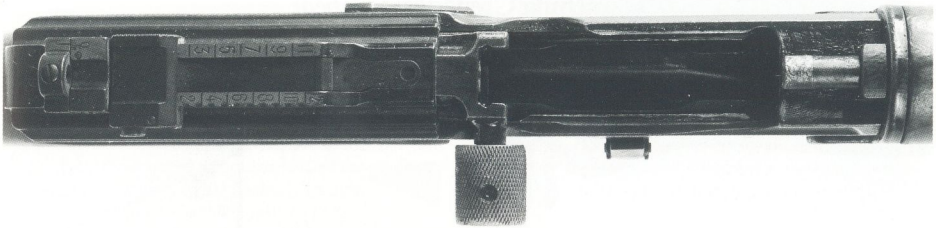
With the right hand, pull the bolt backwards so that the end of the gas tube can be seen. Holding the bolt in this position, press the trigger with the left hand so that the hammer goes forward. Guide the bolt forward.

Safety

To make the rifle safe, lower the safety lever. This will block the trigger and hamper the introduction of a finger into the trigger guard.

If the safety lever is lowered when the hammer is down or uncocked, it is necessary to previously take the safety off before the bolt is moved. [Because the trigger is blocked, the hammer cannot engage its sear and problems could arise if the bolt forces the hammer and other parts.]

Adjusting the Micrometer Rear Sight



149. Top closeup view of the receiver of the MAS 49, showing (left) the peep and elevation screw of the micrometer rear sight, and (centre) the bolt and carrier locked in the open position.

Note the knurled nylon cocking knob, and the charger guide, built into the front of the bolt carrier.

Take the slide between the thumb and index finger, press the catch and move the slide to the chosen range marking on the leaf.

Zeroing the Micrometer Rear Sight: Windage

With a screwdriver, turn the screw on the right side of the peep sight so that the sight moves in the required direction (the rear sight is moved INTO the error). A complete turn moves the sight one graduation, or one thousandth, which means a movement of 10cm (roughly 4") at 100m.

Zeroing the Micrometer Rear Sight: Elevation

Turn the peep sight in the desired direction with a screwdriver. Each click or half turn provides a correction of 0.5 thousandth, which means a movement of 5cm (2") at 100m.

Operation of the MAS 49

When the shooter pulls the trigger, the sear frees the hammer which hits the firing pin, and the shot is fired.

When the bullet passes the gas port, some of the gas enters the gas tube and is directed into the bolt carrier. The jet of gas pushes the bolt carrier backwards.

Recoil Movement

During dwell time the bolt carrier recoils freely for about 10mm (.4") and then the unlocking ramps contact the heel of the bolt and force it up from the support of the locking shoulder. The bolt assembly recoils, the firing pin withdraws, the recoil spring is compressed, and the hammer is cocked on the sear (then by the trigger when the shooter lets go of the trigger). The empty case is extracted from the chamber and is held by the extractor claw. The ejector hits its stop and kicks out the empty case. The bolt assembly comes into contact with its stop.

Forward Movement

The bolt assembly is pushed forward by the recoil spring. A new cartridge is introduced into the chamber. The bolt closes, and the extractor claw clips into the cannelure of the cartridge. The heel of the bolt is lowered in front of the locking shoulder and ridden over by the bolt carrier, to secure it before presenting the firing pin.

When all the cartridges have been expended, the magazine follower raises the bolt stop, which holds the bolt in its rear position.

Maintenance

Before firing: clean off any oil, and clean the barrel of any foreign material with a dry patch, then lightly lubricate all moving parts.

After firing: clean the barrel with a rod and patch saturated with powder solvent. Dry carefully and lightly oil the barrel.

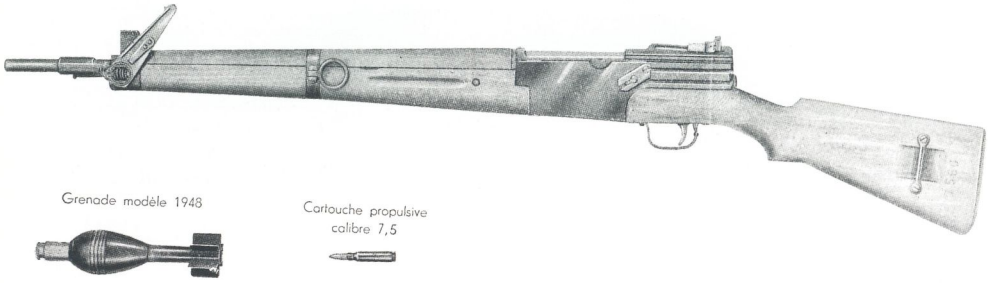
Complementary Cleaning

The Instruction Manual recommends complete cleaning of the rifle followed by a light coat of oil upon return to quarters.

Periodic Maintenance

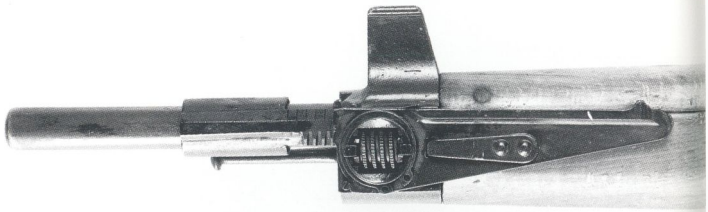
Regulations require cleaning of the barrel and the chamber every two days, and every eight days for the other parts. In salty regions and under humid or sandy conditions, maintenance must be done at shorter intervals depending on the needs.

Launching Grenades: a *Caveat*



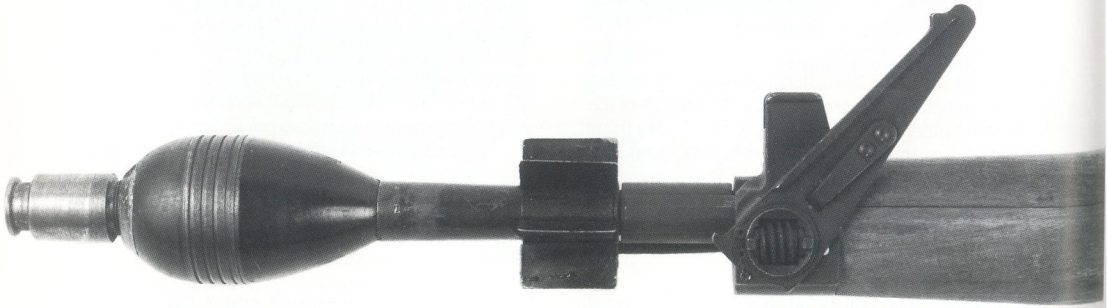
150. Part of Plate II from a MAS 49 manual.
Above: left side view of rifle, showing grenade sight raised.

Below: Grenade, *Modèle* 1948, and the wooden-bullet 7.5mm propulsive grenade cartridge. courtesy MAS



151. Two views of the "built-in" MAS 49 grenade launcher.
Above: grenade stop threaded forward to show gearing; grenade sight folded down.

Below: *Modèle* 1948 grenade in place on spigot, grenade sight raised. The muzzle is raised to align the rear 'V', top, with the front blade at the other end of the grenade sight.



Like the MAS 44 Type A, the MAS 49 was specifically designed to launch rifle grenades. All of the Technical Manuals on the rifle mention this possibility, but curiously, the Manuals on grenades strongly warn against their use! This is because the rifle still did not have a gas cutoff valve, and the premature opening of the bolt heavily stresses the mechanism. For this reason, the grenade launcher was later eliminated on certain MAS 49 rifles.

Launching Grenades: Procedure

Place the rifle on the ground at an angle of about 45°. Try not to place the stock on a hard place.

Withdraw the magazine.

Push in the locking button and raise the sight arm.

Turn the serrated worm gear so that the graduated spigot is brought out to the desired distance.

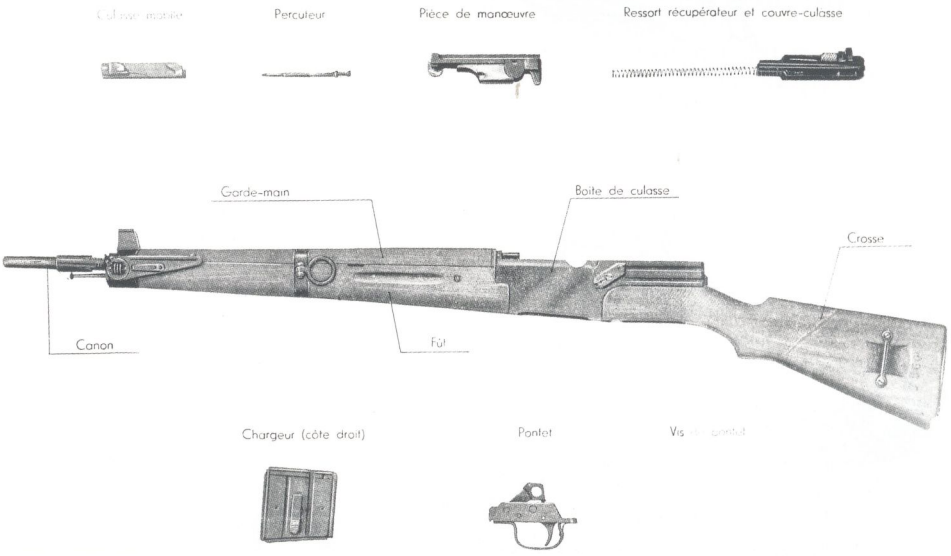
Take the grenade safety off.

Slip the grenade over the muzzle.

Load the launching cartridge into the chamber.

152. The MAS 49 in its main battleground, French Indochina.
courtesy D R

Stoppages



153. The MAS 49, field stripped. Further disasssembly by the individual soldier was not allowed.
document courtesy MAS

Immediate Action

If a stoppage happens at a firing range, the shooter keeps the weapon pointed downrange and requests an instructor.

According to the Instruction Manual, if the rifle does not shoot after percussion, wait three minutes before opening the bolt, in case of a hangfire.

Then withdraw the magazine, latch the bolt to the rear, and place the rifle on safe.

Examine the chamber, the cartridge or the ejected case.

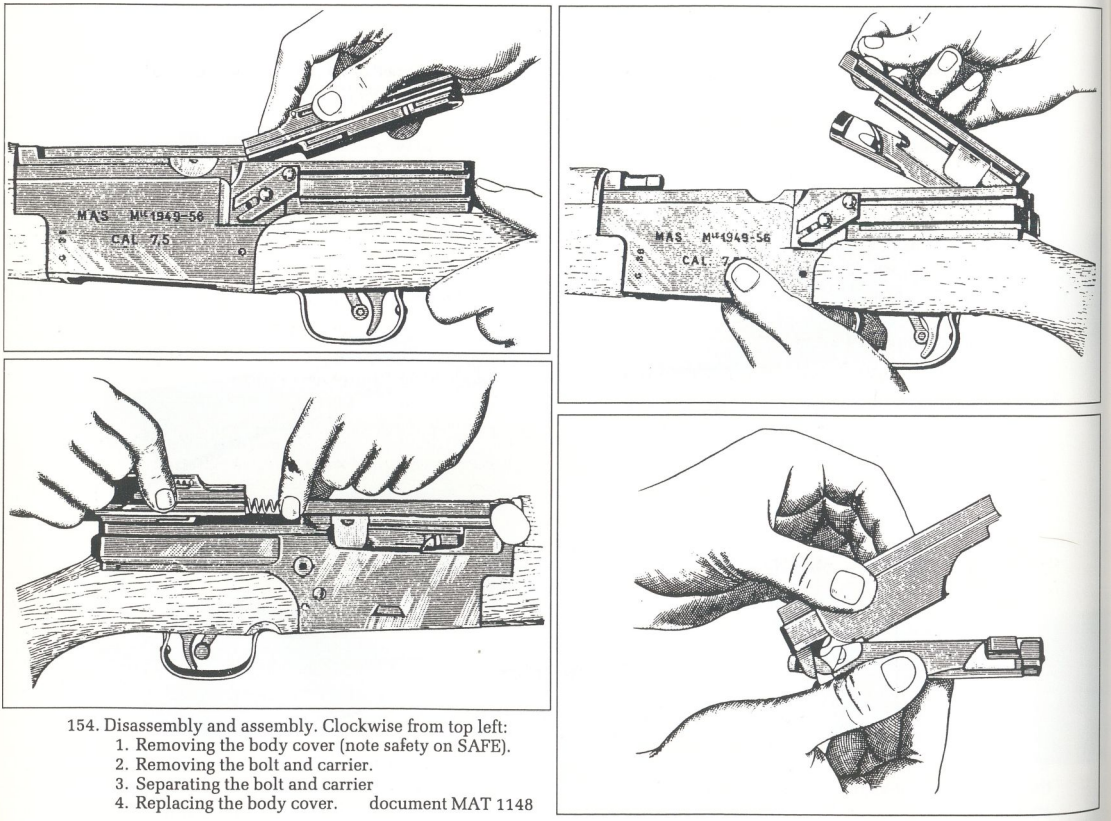
After having identified the reason for the stoppage, fix it according to the reason.

In combat, move the bolt quickly to eject the cartridge. Try to resume firing with the next cartridge. If the problem continues, the rifle must be tagged and sent for repair.

Principal Causes of Stoppages

- dirty rifle or magazine
- magazine defect
- ammunition defect (no fire, hang fire). Verify that the bullet did not remain in the barrel, and if so, push it out with the rod.
- breakage or deterioration of a part (firing pin or extractor).
- jamming by non-ejection (not assignable to the ejector or its stop), due to either fouling of the gas tube or leakage at the end of the gas tube due to excessive brushing or lack of oiling. The cause of this leakage is not easily determined by the average soldier. The only solution is to send the rifle back to the State arsenal to have the gas tube replaced.
- Premature hammer fall causes burst fire (the trigger system to be adjusted by the armourer).

Rifle Disassembly and Assembly



154. Disassembly and assembly. Clockwise from top left:
1. Removing the body cover (note safety on SAFE).
2. Removing the bolt and carrier.
3. Separating the bolt and carrier
4. Replacing the body cover. document MAT 1148

- Withdraw the magazine.
- Pull the cocking handle to the rear, make sure that the chamber is empty.
- Let the bolt go forward.
- Leave the hammer cocked and lower the safety.
- Lower the receiver cover lock with the thumb.
- Push the receiver cover forward and raise the rear part while retaining the spring.
- Withdraw the recoil spring.
- Pull the cocking handle/bolt assembly to the rear and pull up to withdraw the assembly.
- Separate the bolt from the bolt carrier.
- Take out the firing pin.

It is not necessary to continue disassembly for normal maintenance of the rifle.

Assembly is done in reverse order.

To replace the recoil spring it is necessary to use both hands, to avoid any deformation to it.

Firing Pin Replacement

See Chapter Nine, Servicing.

Replacement of Extractor

To remove, hold the bolt at the rear and tap its front against a piece of wood.

To replace the extractor, insert it and its spring in their place on the bolt. When the bolt is forward, compress the extractor spring with the blade of the hook-ejector/screwdriver, at the same time putting pressure on the extractor.

Accessories and Ancillaries

List of Stores and Equipment

Normal for all troop types

Reference No 150 611 250 450:

- one complete leather sling;
- two leather cartridge pouches Model 1945, modified;
- one leather belt with moveable keeper, Troop Model, 45mm (1¾") wide. Distributed in three lengths on the following basis: 45% size 2 (1.05m [41"]), 50% size 6 (1.15m [45"]), 5% size 9 (1.25m [49.2"]);
- a leather trapezoidal frog.

Airborne troops type *Troupes aéroportées* (TAP)

Reference No 150 613 250 150:

- a cloth sling Model TAP
- two cloth cartridge pouches Model TAP
- cloth belt Model TAP

Documentation

- Concise Technical Guide : MAT 1031(ex MAT 1067/2)
- Repair Manual: MAT 1148
- Army Material Nomenclature: MAT 1207(ex 153-64)
- Illustrated Catalogue: MAT 1199
- Collective Unit Chart: MAT 1302

References

- nomenclature number: 153.640.500.100
- code EMAT number: 1130.18

Packing

From 1950 to 1960, the 7.5mm Model 49 rifles were packed eighteen per box No 150 911 131 400.

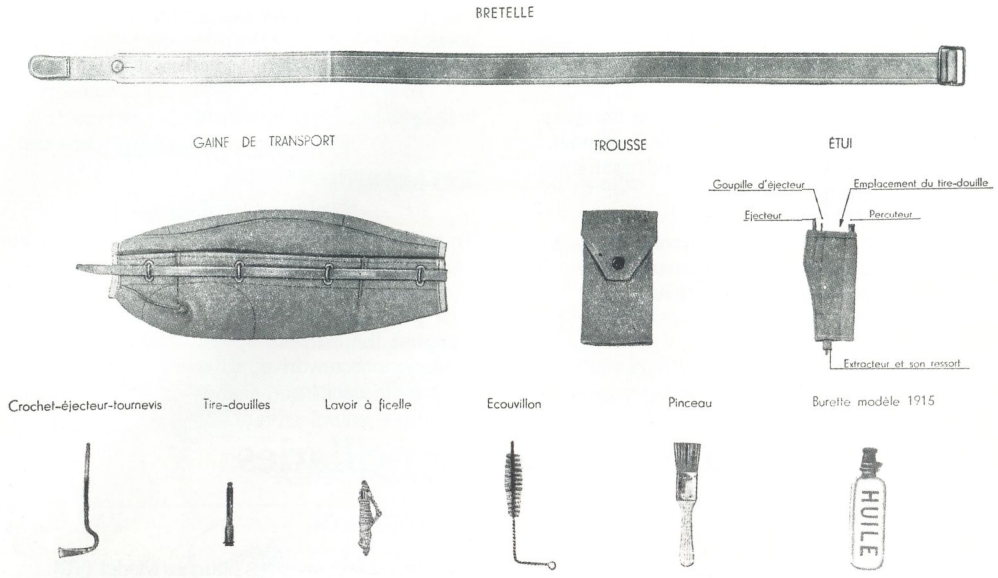
Spares

Spare parts issued with each MAS 49 were impressively few:

- one extractor with spring
- one firing pin

Accessories

In addition to four magazines and one copy of the technical guide MAT 1031 (ex MAT 1067/2), each individual rifleman was issued with the accessories shown in fig 155 (overleaf):



155. Issued accessories and cleaning equipment, MAS 49. From top, left to right:

Leather sling, *Modèle* 1936; cloth transport cover (protects only the receiver), leather or cloth case for accessories, leather or cloth bag for spares (ejector, ejector pin, firing pin, extractor and spring); hook-ejector/screwdriver, ruptured case extractor, *Modèle* 1922 pullthrough, elbowed chamber brush, flat 21mm brush, *Modèle* 1915 oil bottle.

courtesy MAS

Magazine/Cartridge Pouches

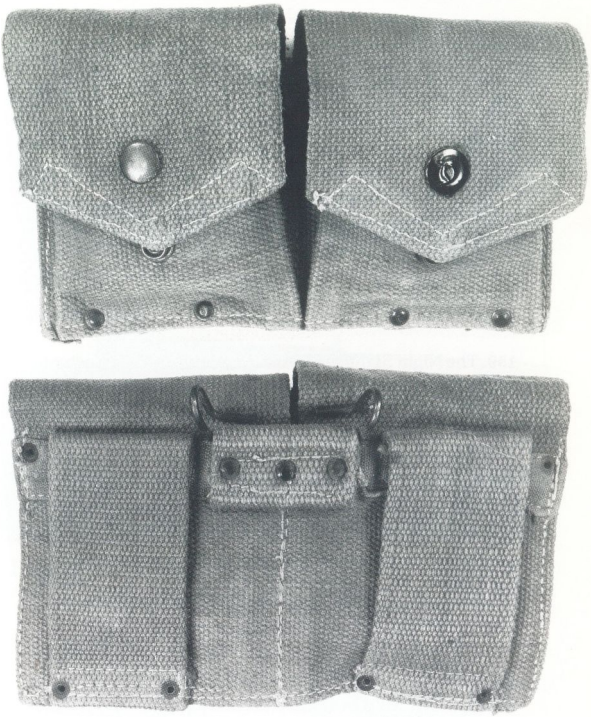
156. Front (left) and back (right) views of the "*Modèle* 1945 Modified" leather pouches, which hold two magazines each for the MAS 49.

In addition to his four magazines, every man issued the MAS 49 received two magazine/cartridge pouches with two pockets each, which could be used to carry MAS 49/MAS 49-56 box magazines or MAS 36 stripper clips.

When the MAS 44 was first issued the cartridge pouch, known as the Model 1945, had pull-strips to aid in removal of the magazines.

In the MAS 44 Type A of 1947, the magazine with elastic clamp was replaced by the magazine with inte-

157. A French soldier circa 1980, equipped with a MAS 49, not fitted with a grenade launcher.
Note the tan-leather *Modèle* 1945 Modified magazine pouches. courtesy D R



158. Front (above) and rear (below) views of the khaki-coloured cloth MAS 49 two-magazine pouches, issued to airborne troops.
Note (below) the belt hanger (for US-style eyeletted belt).

gral side-locking latch. This required that the openings in the Model 1945 pouches be made larger to allow the magazine latches to fit in. Pouches so modified and with the pull-strip eliminated are called "Model 1945 Modified".

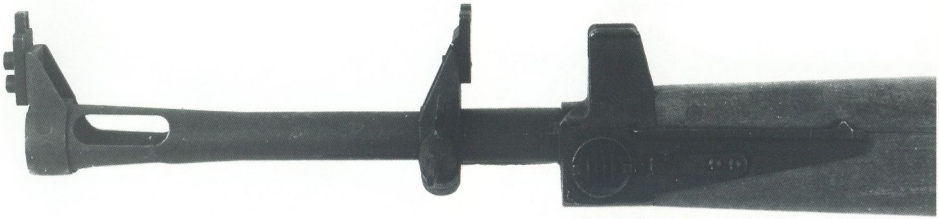
Two types of pouches were made:

- Model 1945 Modified leather pouch, with flaps closed by a strip fixed to an iron or brass stud, and fitted with a belt loop and a hanger ring. Made in pale yellowish-brown leather for the Army and Navy; in black leather for the Air Force and the *Gendarmerie*; and in white leather for all services for parades.
- khaki-coloured cloth pouch for airborne troops. Strips are fixed by two position snaps.

Ancillaries

While the MAS 49 does not accept a stock boot, cheek-piece or blank firing device, some other ancillary items were developed and issued, as follows:

Night Sighting Device DVN (*Dispositif de Visée Nocturne*)



159. The Night Sighting Device (*Dispositif de Visée Nocturne*; DVN) attached to the MAS 49 as described in the text.
The DVN has a pair of phosphorescent light sources with a 'U'-notch rear sight between, adjustable for windage, and a phosphorescent front sight adjustable for elevation.

The Night Sighting Device (*Dispositif de Visée Nocturne*; DVN) is a conical sleeve which serves as a flash hider. It is fixed at the end of the barrel by a ring tightened by a wingnut. It has a 'U'-notch rear sight, which can be regulated for windage, and a front sight which can be regulated for elevation. Both are phosphorescent.

The DNV allows night firing up to 100m.

Rope Launcher

The Navy uses a rope launching device in steel (for ships and land use) and aluminum (for aircraft).

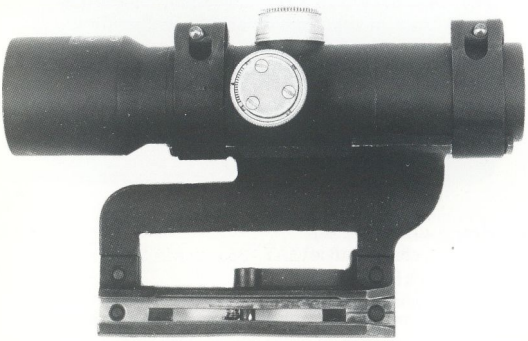
The projectile is formed of three cylindrical wood pieces and two leather washers placed on a threaded rod. It is fired by a bulletless launching cartridge. It drags a 110 to 120m long nylon line mounted on a ball holder, kept on the rifle's forend by a clamp.

This device can be mounted on the MAS 36, MAS 44 or the MAS 49.

A machine serves to rewind the ball before use. The accessory case contains:

- 1 launcher
- 2 wood projectiles
- 2 ball holders with their lines
- 1 package of eight cartridges

The Telescopic Sight, *Modèle* 1953 (APX L 806)



160. Right side view of the Modèle 1953 (APX L 806) telescopic sight, developed at Puteaux. Shown without rubber eyepiece. Note the female mounting rail, below.

The MAS 49 uses the Model 1953 telescopic sight. It is an optical sight manufactured by the Puteaux Works, where it is known as the APX L 806.

Mounted on the MAS 49 rifle, the Model 1953 telescope allows accurate fire on targets of small dimensions:

- a helmet or head up to 200m
- a prone man up to 400m
- a kneeling or standing man up to 600m

The sight also allows the search and elimination of targets during hours of bad visibility (dusk or clear night).

Description

The Mle 53 telescope is made of a cylinder containing the optical parts. It has a regulating knob with a protec-

161. The *Modèle* 1953 telescope mounted on the MAT 49 proved popular, even to the point of replacing binoculars for spot-scouting with these *troupes parachutistes* of the Foreign Legion. photo courtesy *Képi Blanc*

tive cap for windage and a drum with a crown with graduations for elevation.

A rubber eyepiece makes its use very comfortable. The telescope is fixed to its base by two collars.

Characteristics

power	3.85x
length without eyepiece	159mm 6.25")
weight with base	500g (1.1 lbs)
elevation (in 50m incrs) .	50 to 800m

Mounting

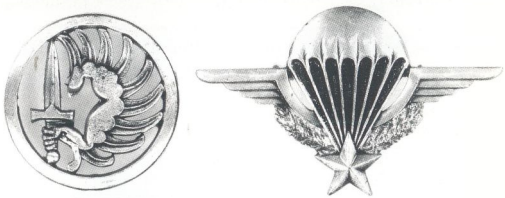
The placement of the telescope is done by moving the locking lever towards the rear, then sliding the rails of the base into the grooves on the left side of the receiver in a manner reminiscent of the German ZF4 scope for the G43 rifle. Push the locking lever to the front.

It must be carefully verified that the collars are well secured and that the locking lever axis is not loose.

Because of experience, the rifles to be used with a telescope are selected because of their accuracy and they are no longer to be used to launch grenades. Once the telescope joins the rifle, they become an inseparable unit always issued to the same shooter.

Adjustment

Adjustment in elevation: use the elevation drum and fine-tune the adjustment (14 graduations of five thousandths, each equivalent to 5cm (2") at 100m.



162. Left: the beret insignia of the French *troupes parachutistes* (paratroops). Still in use.
Right: The Service insignia of the French *parachutistes*, awarded to fully-qualified, jump-tested troops. Still in use.

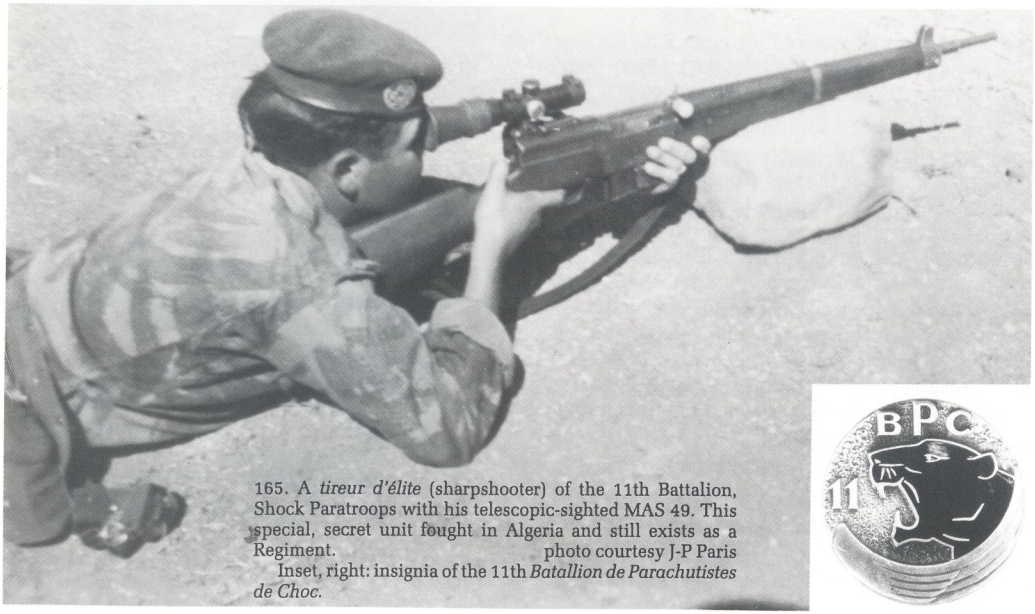
Adjustment in windage: with the windage knob on the side of the body (8 graduations). Each "click" is equivalent to 7cm (2¾") at 100m. Adjustment by half graduations is possible.

Accessories

- leather transport case
- adjustment key
- technical guide MAT 1853 (ex MAT 1967/1)

163. Top closeup view of the leather transport case for the *Modèle* 1953 (APX L 806) telescopic sight with cover open, showing position of sight and eyepiece.
Note scope adjustment tool, in leather pocket on cover.

164. Front view of the leather transport case for the *Modèle* 1953 telescopic sight, showing method of securing cover.



165. A *tireur d'élite* (sharpshooter) of the 11th Battalion, Shock Paratroops with his telescopic-sighted MAS 49. This special, secret unit fought in Algeria and still exists as a Regiment. photo courtesy J-P Paris
Inset, right: insignia of the 11th *Batallion de Parachutistes de Choc.*

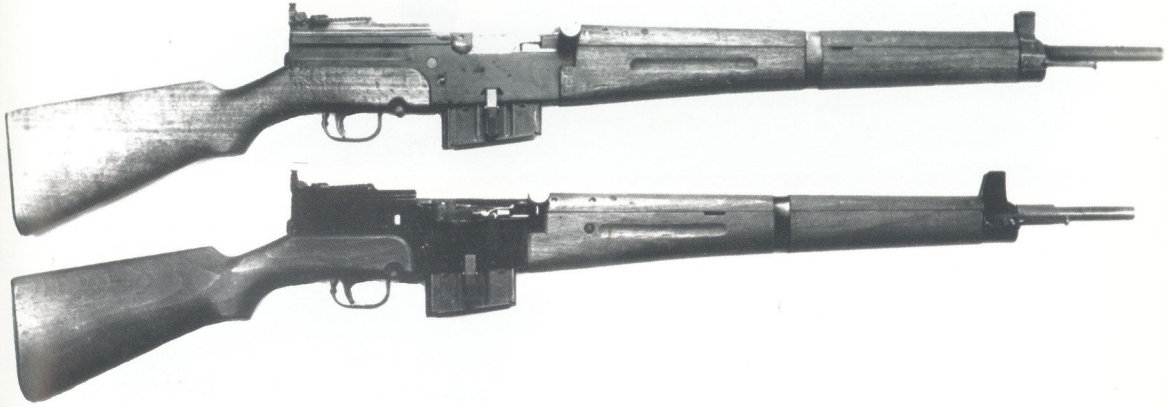
MAS 49 Variants

A Word on Postwar Supply and Demand

NATO was being formed just as the MAS 49 was first issued, and the 7.62mm NATO round was already under development (for eventual adoption in 1954). To the exhausted European Allies, the availability of immense quantities of WWII-surplus US arms and ammunition was a powerful incentive in those days of postwar shortages. As noted, France was involved in several programmes using the .30 US Carbine round: several hundred thousand surplus M1 Garands and Carbines were supplied as US aid to French units in Indochina and elsewhere. For some time, adoption of the US .30-'06 round as a rifle standard was seriously considered by both France and Britian.

Several prototypes were manufactured in France in .30-06, including the MAS 36-51, the MAC 31 machinegun, the MAC 47, the MAS 50, the AME and the AA52 experimental machineguns, but none of these was retained in the American calibre.

The Long-Receiver MAS 49 in 7.62mm (.30-'06)



166. Right side views of two rifles used in troop tests from 1949 - 1951.
Above: MAS 49 in 7.62x63mm (.30-'06). About 30 were manufactured. Note the longer receiver, taken from the MAS 1940 but fitted with a detachable box magazine.
Below: a MAS 44 A in 7.5x54mm, fired as a control.
courtesy CAA

The MAS 49 did not escape this study. A limited series of about thirty autoloading rifles was manufactured for troop tests and military academies, made with a longer receiver taking the same proportions as the MAS 40 receiver, but fitted with a detachable box magazine.

The metric nomenclature of the .30-'06 is 7.62x63mm. Thus, in those pre-7.62mm NATO days, the .30-'06 itself was known in France as the 7.62mm.

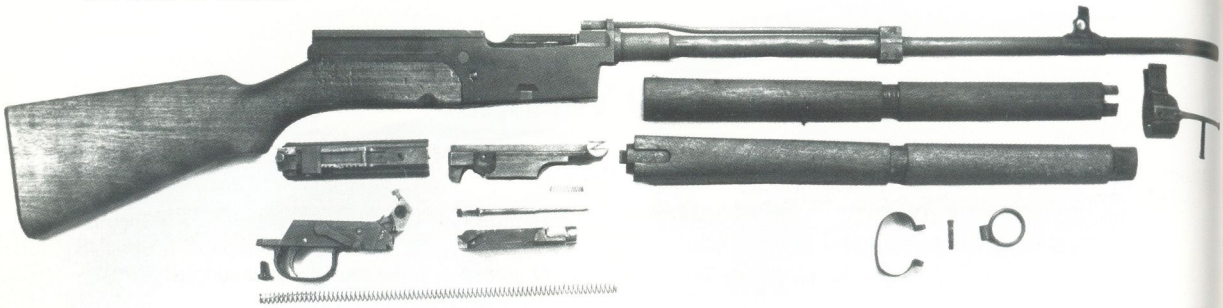
Four models were made of the MAS 49 in 7.62mm (to use the official denomination):

1. MAS 49, 7.62mm without grenade launcher.
2. MAS 49, 7.62mm firing the Model 1948 grenade; this model will also accept a 22mm sleeve with a bayonet mount.
3. MAS 49, 7.62mm with 22mm launcher, fixed grenade sight and adjustable grenade stop
4. MAS 49, 7.62mm with 22mm launcher, folding grenade sight and adjustable grenade stop.

MAS 49 7.62mm barrels have four-groove rifling, right hand twist, with one turn in 254mm (10").

MAS 49 7.62mm rifles were first tested at Versailles from July, 1949 to April, 1951 in very hard trials comprising grenade launching and sustained fire. Nine Army units took part in these trials.

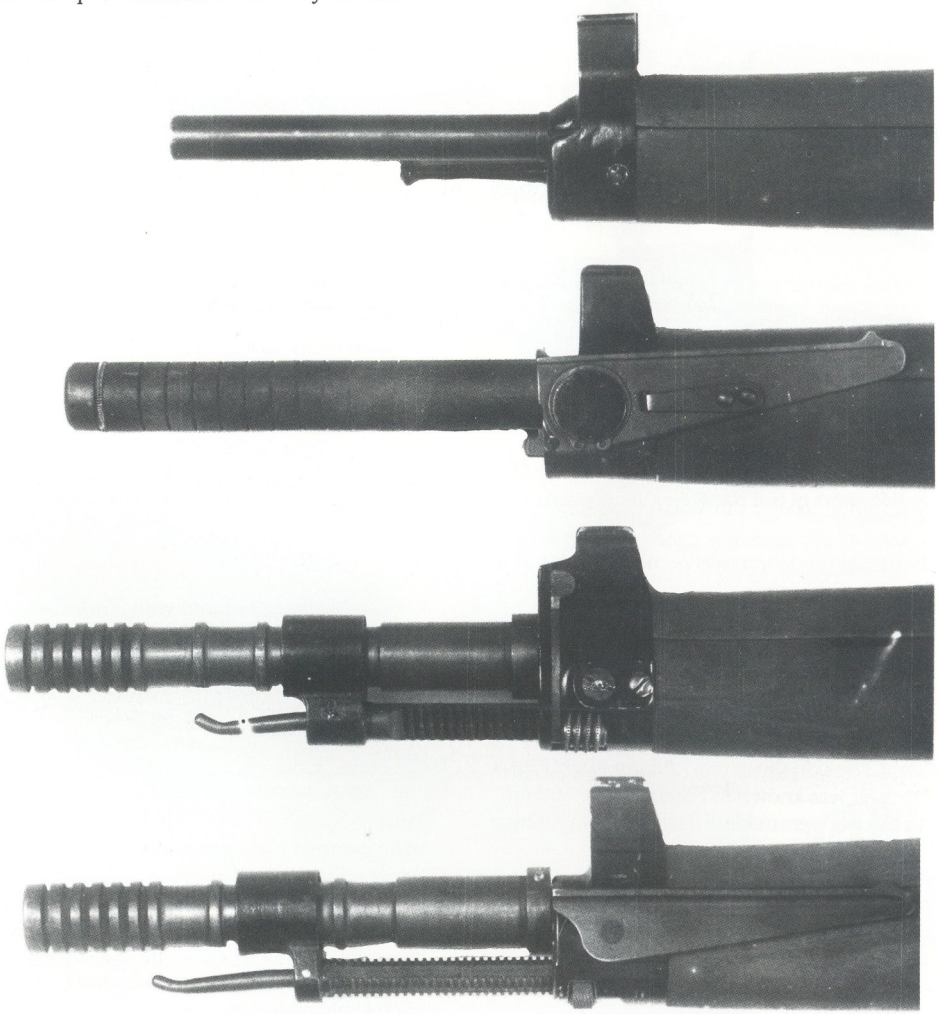
The rifles were compared to the M1 Garand, to the MAS 36 and the 7.5mm MAS 49. The results were generally good. The MAS 49 in 7.62mm was judged simpler and more precise than the Garand, but not completely perfected.



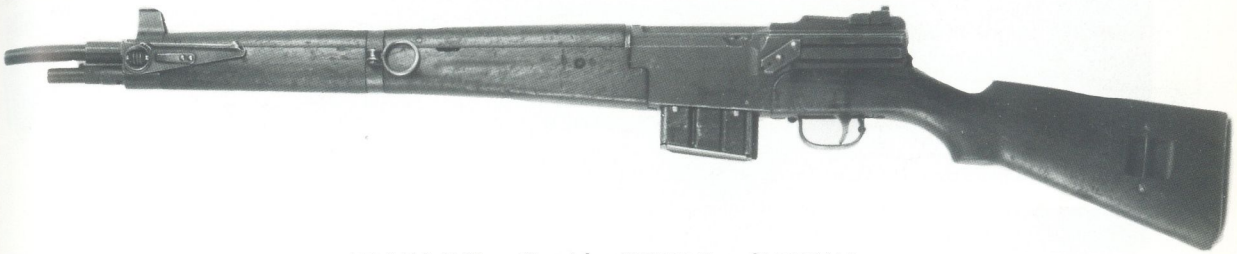
167. The MAS 49 in 7.62x63mm (.30-'06), disassembled. Note absence of grenade launcher: this is a 'Type 1' 7.62mm rifle (see below). Compare with the 7.5mm version (fig 153): note lengthened components. courtesy CAA

168 (below). Four different versions of the MAS 49 in 7.62mm (.30-'06) were produced for trials. From top:

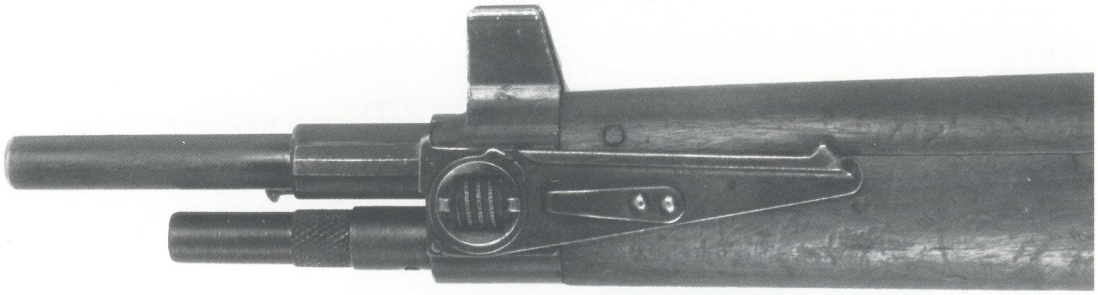
1. without grenade launcher.
2. with launcher assembly for Model 1948 grenade. This rifle will also accept a 22mm sleeve with a bayonet mount.
3. with 22mm launcher with fixed sight and adjustable grenade stop.
4. with 22mm launcher assembly with grenade sight and adjustable grenade stop. courtesy CAA



The MAS 49 "Export"



169. MAS 49 "Export", serial no F 39820. One of 6,000 MAS 49s made for Syria (described in the text).
courtesy Universal Arms



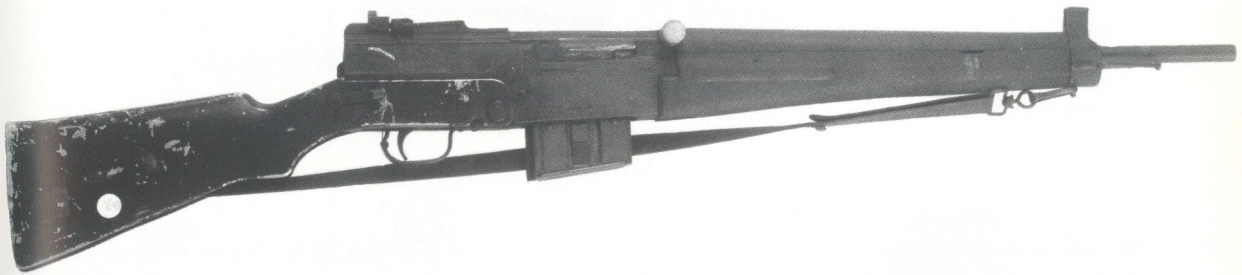
170. Left side closeup of muzzle area of Syrian Export MAS 49 serial no F 39820, showing grenade launcher. This model also featured the built-in *Modèle* 1936 bayonet.
courtesy Universal Arms

Syria ordered 6,000 MAS 49 rifles of a particular version.

This model was equipped with an upper band similar to that of the MAS 36 LG 49, with a grenade sight and launcher for the Model 1948 grenade. The forestock is hollowed out to receive the Model 1936 bayonet.

Some of these appeared in France in 1992, deactivated for over-the-counter sale. At the same time others were imported into the USA and sold in working order on the American commercial market by Century Arms Corporation.

The Folding-Stock MAS 49 CR



171. MAS 49 CR (*crosse rabattable*; folding stock), serial no 39. This example is in 7.62x63mm (.30-'06) and is built around the long receiver.

The hollow, cast-aluminum buttstock is similar to that of the bolt-action MAS 36 CR 39, and folds under the rifle. The sling is tensioned on a spring-loaded spool inside the hollow butt, and retracts automatically when unhooked from the front swivel. Not equipped with either bayonet or grenade launcher.

172. Left side closeup of MAS 49 CR in 7.62x63mm (.30-'06) serial no 39, showing markings.

Produced on the long receiver derived from that of the MAS 1940 (fig 107) but fitted with a detachable box magazine.

173. Right side view of the MAS 49 CR with butt folded in transport position. This reduces the length of the already compact MAS 49 to 75cm (29.5"). Designed for paratroop use, where space and weight are at a premium.

The MAS 49 CR (*crosse rabattable*; folding stock) is fitted with a hollow, cast-aluminum stock similar to that of the bolt-action MAS 36 CR 39. The stock folds under the rifle. The sling is wound on a spring-loaded spool in the hollow buttstock, and retracts automatically when its front hook is released.

The example which the author examined and photographed (serial no 39, above) was chambered for 7.62x63mm (.30-'06) and was built on the long receiver. It does not have provision for a bayonet or a grenade launcher.

Characteristics, MAS 49 CR (7.62mm)

calibre	.30-'06
overall length	1.020m (40")
length with butt folded	75cm (29.5")
barrel length	47cm (18.5")
weight	4.600kg (10.14 lbs)
magazine capacity	10 rounds

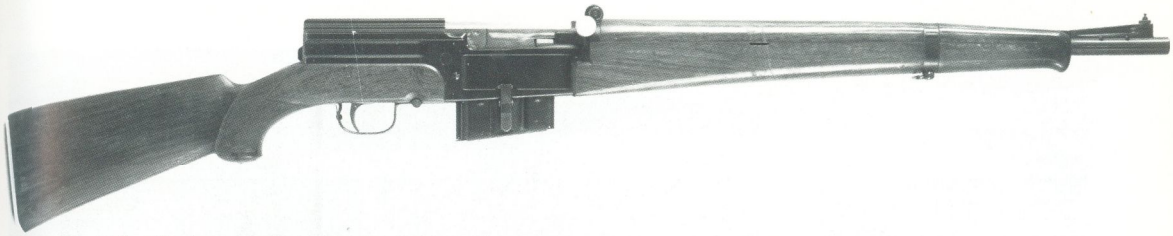
It is possible that a MAS 49 CR version in 7.5mm was studied or manufactured.

The MAS Hunting Carbine

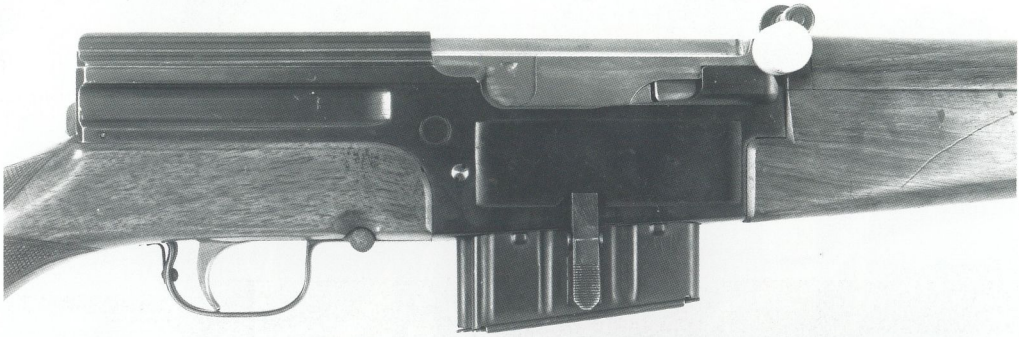
After World War II the St-Etienne factory (MAS) diversified its activities, making side-by-side shotguns, .22LR carbines and bolt-action hunting carbines built on the MAS 36 mechanism. MAS also tried to perfect an automatic carbine using the MAS 40 mechanism with a long receiver (260mm instead of 230mm).

The use of the long receiver indicates that the MAS designers were planning to chamber the Hunting Carbine for a variety of popular high-powered hunting cartridges (although as a military calibre, .30-'06 was prohibited for hunting use in France).

However, only one prototype seems to have been manufactured: serial no 1, shown here, chambered for



174. Right side view of the MAS Hunting Carbine serial no 1, in calibre 7x57mm Mauser. Overall length 1.105m (43.5"); barrel length 59cm (23.2"). Magazine capacity 10 rounds. The buttplate is of aluminum.



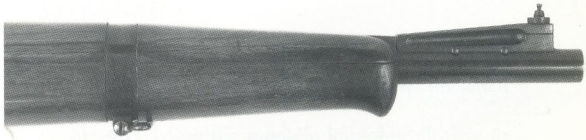
175. Two closeups of the long-receiver 7x57mm MAS Hunting Carbine serial no 1.

Above: right side view. Note the fine finish on the stock, and the checquering on the pistol grip. The metal parts are all polished and blued except the bolt and carrier, which are chrome plated.

Below: left side view showing markings.

the 7x57mm Mauser cartridge, which at the time was authorised for over-the-counter sale in France. The rifle has nicely polished and blued metalwork, with the bolt and carrier assembly chromed. The stock is walnut, with checquered grip and forend. The buttplate is aluminum.

Sighting is done through an open 'U'-notch rear sight, adjustable to 100, 200 and 300m through an eccentric knob, and a front sight bead placed on a ramp.



176. Right side closeup of the muzzle end of the 7mm MAS Hunting Carbine serial no 1, showing (from left) the stock band and front sling swivel, the *schnabel* forend, and the ramped front sight bead.

177. The Infantry Regiment of the *Garde Républicaine* presents arms with their MAS 49-56 rifles, bayonets fixed, at the *Arc de Triomphe*, one of Paris' best known monuments.

The unknown soldier, buried underneath, and the eternal flame which has burned here without interruption since 1919 make the *Arc de Triomphe* a focal point for military honours in numerous patriotic and political ceremonies, including one held at the close of every day at 6 p.m.

Often the unit holding this nightly ceremony is the *Garde Républicaine*, whose official duties include guarding the President and Prime Minister of France. Two Regiments exist: the Cavalry (with horses, sabres, and typical old-style chromed helmets with horsetails) and the Infantry, shown here, which uses several traditional dress uniforms.

photo courtesy *Garde Républicaine*

Chapter Eight

The Final Design: the MAS 49-56

Introduction: NATO and the Crucial Fifties

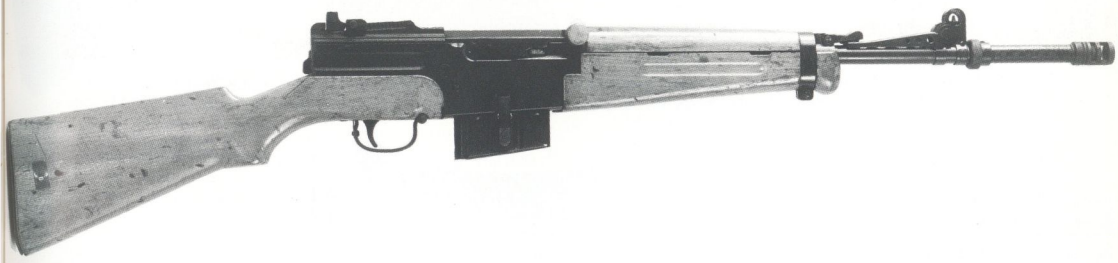
The planned European Defense Community gave way to the new North Atlantic Treaty Organisation (NATO), founded in 1949.

During the early 1950's, the French Army was still equipped with the most varied collection of rifles; principally French and American:

- MAS 36, MAS 36 CR 39, MAS 36 LG 48 and MAS 36-51 bolt-action rifles;
- Model 1916 bolt-action muskets;
- MAS 44 and MAS 49 autoloading rifles;
- US M1 and M1A1 Carbines (155,356 Carbines were furnished until 1964 under US Military Assistance Programmes);
- US M1 Garand rifles (232,499 furnished under US Military Assistance Programmes);
- obsolete Lebels, Models 07-15 and 1916 Mannlicher-Berthiers, Models 1892 and 1916 muskets; Enfield M1917 and Springfield M1903 rifles.

The US T65E3 cartridge (7.62x51mm) became NATO standard in December, 1953, and member countries were encouraged to adopt the new round. Thus, in continuation of the semi-automatic rifle project, France started developing assault rifles in 7.62 NATO calibre.

Modernising the MAS 49: the MAS 49-54 and MAS 49-55



178. Right side view of the MAS 49-55, the prototype prefiguring the final, definitive model.

As good as it was, the MAS 49 lacked some modern requirements. Most importantly, it did not have a gas cutoff, and so could not launch heavy 22mm finned grenades without severely stressing the action.

Neither did it have a bayonet. The idea of an *integral* bayonet, housed in a tube in the forestock, had been expressly rejected in the programme specifications of October 20, 1946, which had led to the MAS 44 A. Still, a modern, detachable bayonet-knife did present a certain utility.

In 1953, using the grenade launcher already in service on the MAS 36-51 and the test results from trials of different grenade launchers on the MAS 49 in .30-'06

(discussed in the last chapter), a MAS 49 was prepared expressly to launch 22mm finned grenades.

After trials with this rifle, known as the MAS 49-54, the pre-series rifle appeared the following year as the MAS 49-55. Here the forestock was shortened, the rifle lightened and additional modifications made, the most important being the addition of a gas cutoff valve so the gas port could be closed when firing grenades, essential for launching heavier projectiles.

The MAS 49-55 presented a few noticable differences from the issue MAS 49, as follows:

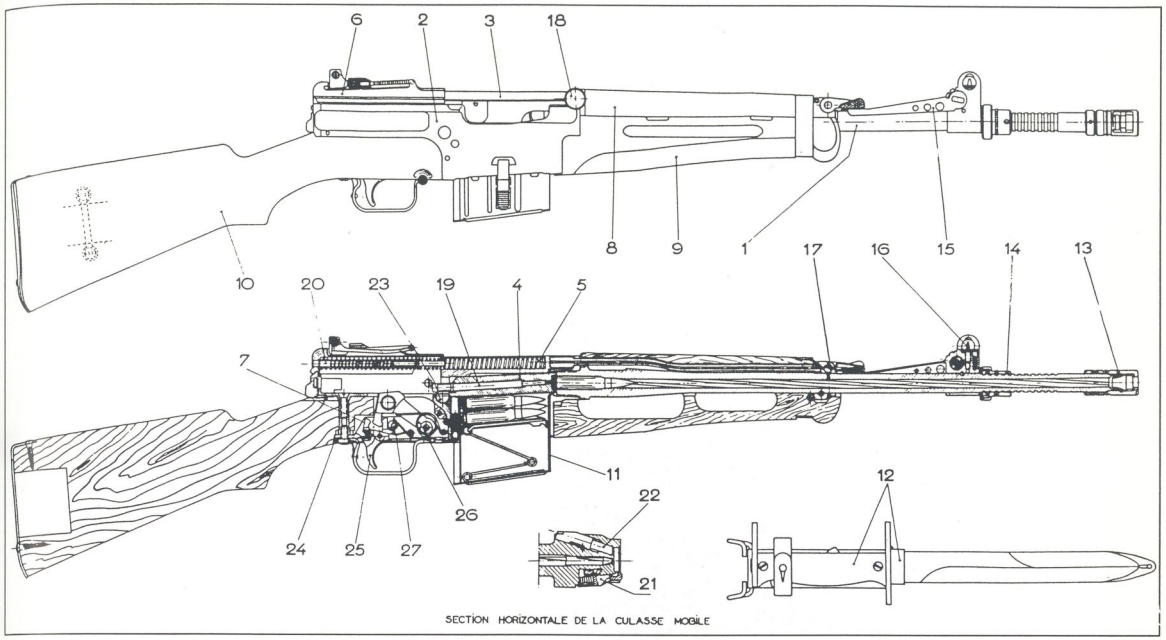
- peep sight adjustable for windage only
- 22mm grenade spigot
- more space between indentations on the barrel

Adopting the MAS 49-56

179. Right (above) and left (below) views of the MAS 49-56 rifle, the ultimate expression of studies begun in 1921. The buttstock is identical to that of the MAS 49, but from there forward, numerous changes were incorporated.

180. Left side closeup of MAS 49-56 receiver, showing markings. Serial number placement is different, compared with that of the MAS 49 (fig 147).

Note the continuance of the telescopic sight dovetail. The redesigned rear peep sight of the MAS 49-56 was adjustable for windage only.



181. Views of the MAS 49-56.

Above: right side outline. Parts are identified below. The rifle pictured here is fitted with the first type flash hider and second type barrel.

Centre: right side cutaway.

Below: horizontal cross section of bolt showing ejector (no 22) and extractor (no 21); *Modèle* 1956 bayonet and scabbard.

Nomenclature, MAS 49-56 Rifle

1. Barrel
2. Receiver
3. Bolt carrier
4. Bolt
5. Recoil spring
6. Bolt cover with rear sight
7. Firing mechanism
8. Handguard
9. Forestock
10. Buttstock
11. Magazine
12. Knife bayonet and scabbard, *Modèle* 1956
13. Muzzle brake
14. Grenade range ring
15. Grenade sight
16. Front sight
17. Gas vent valve
18. Cocking handle
19. Firing pin
20. Recoil spring guide rod
21. Extractor
22. Ejector
23. Bolt rest/Headspace pin
24. Triggerguard
25. Trigger
26. Hammer and spring
27. Safety

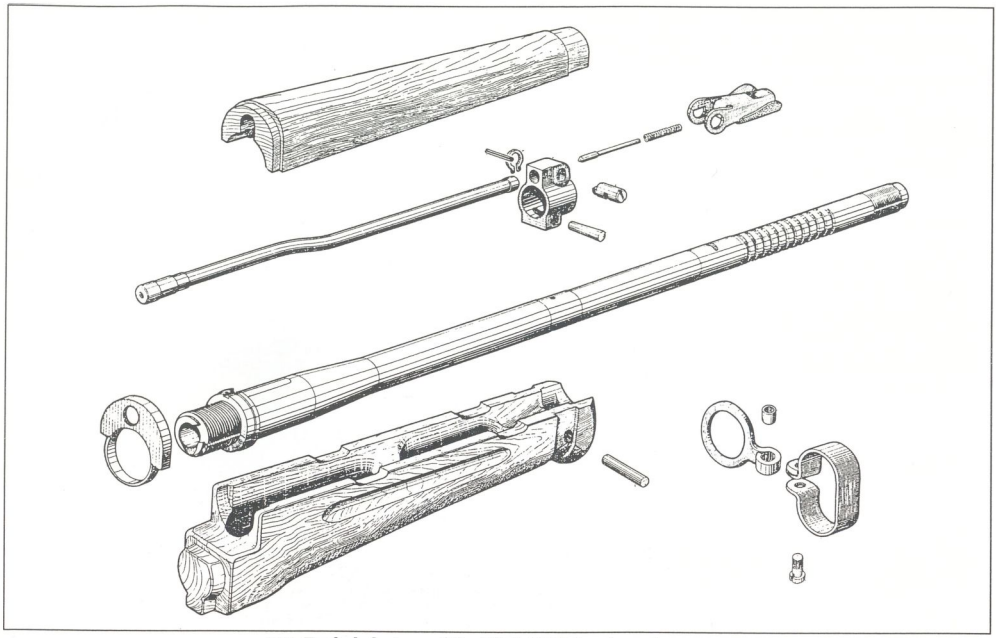
After some improvements, the final design was adopted as the MAS 49-56 on May 24, 1956. The production study and series manufacturing followed, and rifle serial number 1 was accepted on January 9, 1958.

Description of the MAS 49-56

In comparison to the MAS 49, there are a number of differences in the MAS 49-56.

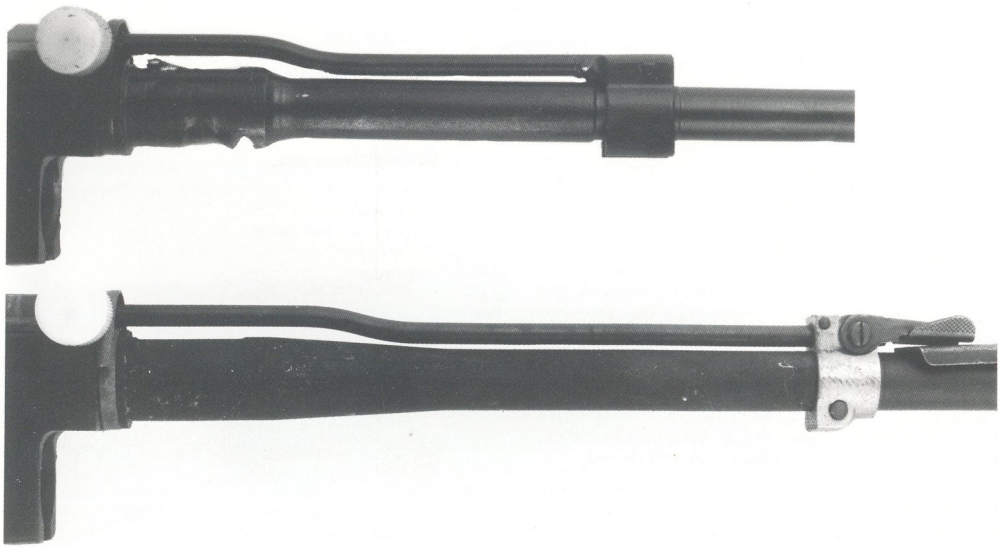
The barrel is 5.5mm shorter, and was originally fitted with a muzzle brake with two lateral holes. This accessory dampened the recoil, but the noise disturbed the shooters, as the report was louder with the muzzle brake fitted. The early brake was accordingly replaced by a later model with a number of small holes. This modification was done in 1963 under Technical Bulletin No 453/ARM.

The forestock and the handguard are shorter and only go as far as the gas vent. The stock is curved

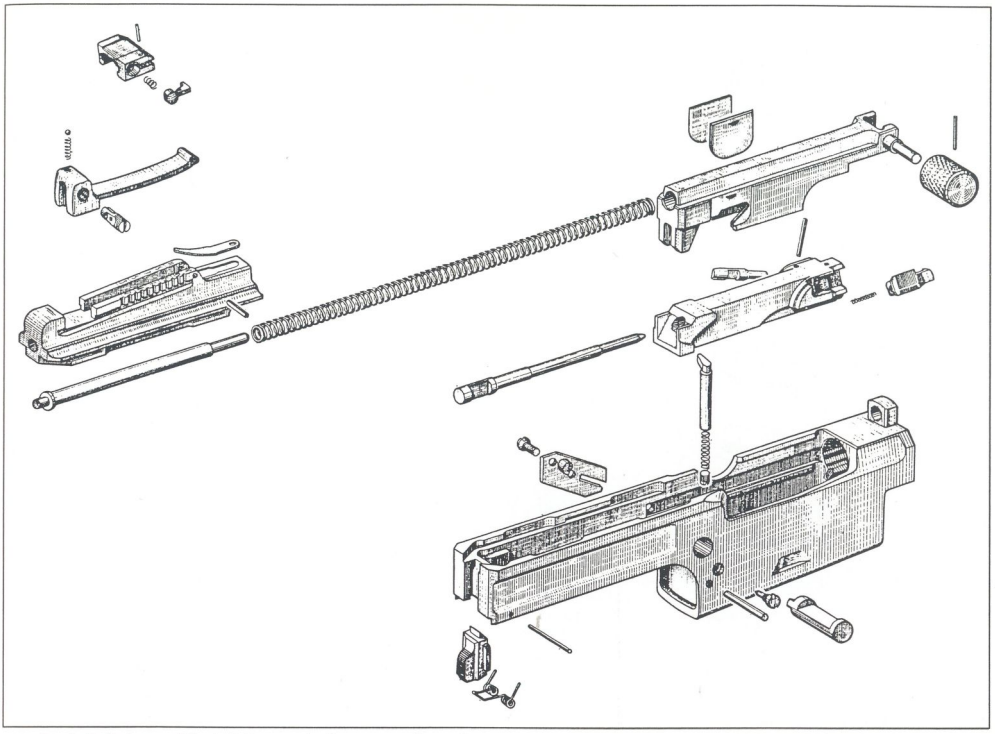


182. Exploded views of the MAS 49-56 handguard, gas system, barrel and forestock. Compare with fig 139: every component is different on the MAS 49-56.

Note the beefed-up gas block, and the gas cutoff assembly, for safe launching of heavy finned grenades.



183. A comparison: the MAS 49 gas system (above) with that of the MAS 49-56 (below). Note the longer gas tube and gas cutoff valve of the final model.



184. Exploded views of the MAS 49-56 body cover and recoil spring assembly, bolt carrier and bolt, and receiver.

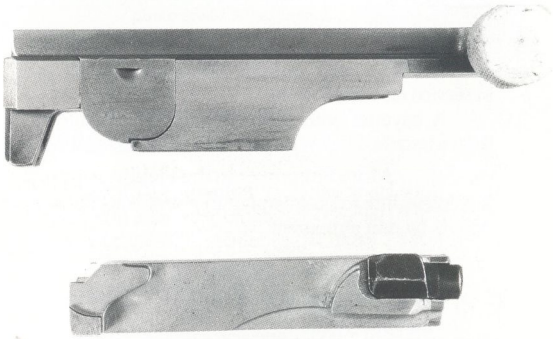
Compare with fig 141. The MAS 49-56 rear sight has been completely redesigned: none of the components of this group are the same. The receiver is also different. However, the bolt carrier, bolt and all internal parts, ejector stop, locking shoulder (headspace pin) and ejector of the MAS 49-56 bear identical part numbers to their MAS 49 counterparts.

underneath and has internal lightening cuts. Two ventilation holes help cool the barrel.

The front of the barrel is ringed with cannelures, around which slides a ring spigot. This ring is movable and limits the introduction of the grenade tube; a button on the left side locks the ring in position. According to the range required during indirect firing, the grenade is deeply or shallowly introduced following the graduations (90 to 190) and the position of the ring.

To the rear of the notches, a steel collar supports the front sight and its protective ears, as well as the axis pin for the folding grenade sight. When folded down, this sight covers the unnotched part of the barrel.

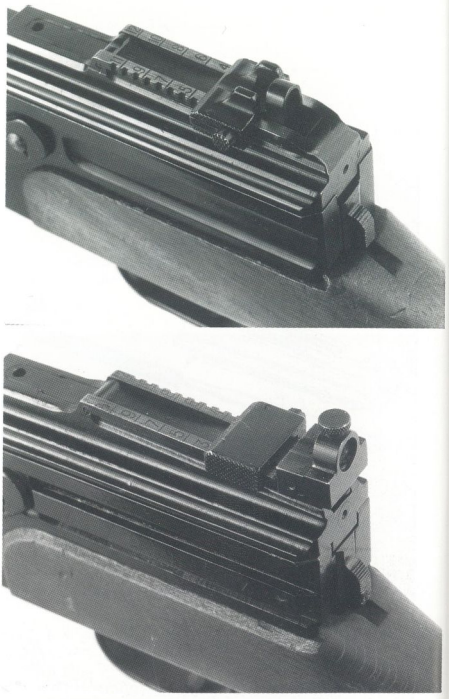
It has a sight scale for direct grenade fire (fig 195): four chevrons graduated from top to bottom: 100 - 75 - 50 - 120 AP; which correspond to 50, 75 and 100m for armour-piercing grenades and 120m for anti-personnel. On the left side are the 'U' rear and front grenade sights for use in indirect fire (fig 196).



185. Right side views of the bolt carrier (above) and bolt of the MAS 49 and MAS 49-56.

Note the dovetailed sideplates on the bolt carrier, which seal the interior locking surface against the ingress of dirt.

186. Rear view through the MAS 49-56 peep sight.
Note the manufacturer's logo (left), and the production date (right).



187 (right). The evolution of the MAS rear sight, which was different on each of the four postwar models of the MAS rifle. From top:
- MAS 44
- MAS 44 A
- MAS 49
- MAS 49-56

The gas port bushing has been moved forward, which makes the gas tube longer than on the MAS 49. There is a gas cutoff valve which must be raised to launch grenades. When raised, the valve masks the rifle's line of sight.

The post front sight is on the collar which holds the grenade sight. It is adjustable for elevation. The rear peep sight is similar to the one on the MAS 49, but is adjustable only for windage.

The magazines are identical to those of the MAS 49. One with a larger capacity (18 rounds) was placed in service on a small scale.

A bayonet with distinctive double attachment rings (described below) is provided as an accessory.

More Firepower in the Field

It is interesting to note certain improvisations done in Algeria by unit armourers:

- two magazines welded head to tail
- two magazines brazed together to increase capacity to 20 rounds
- adaptation of the 25-round Model 1924-29 machine rifle magazine
- adaptation of the 35-round MAC 31 machinegun magazine.

188. The Flag Honour Guard of the 2nd Regiment of Infantry of the French Foreign Legion in Algeria.

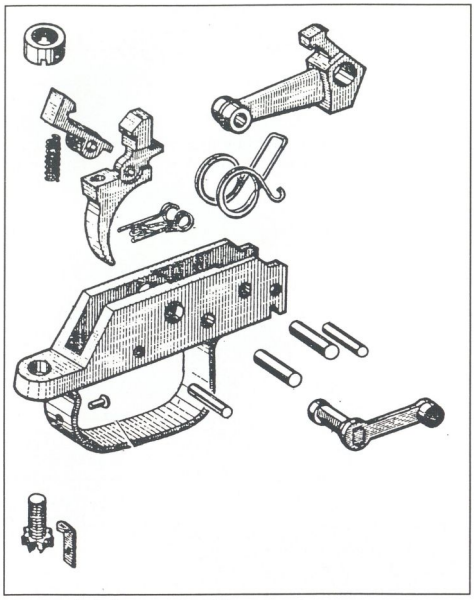
This photo was probably taken at Alger-Maisons Blanches airport. The tail of the aeroplane is that of a Bréguet "Deux Ponts", a typical French transport aircraft of that period.

Algeria was considered by many to be a physical part of France, but many Algerians wanted independence. A bitter campaign by Algerian nationalists began on November 1, 1954, which in France was never (and still is not) called a war but rather the unpopular "Security Operation in North Africa". The French destroyed the Algerian Army, but guerrillas kept killing by bombing and assassination. The French finally acknowledged Algerian independence, and withdrew their forces beginning in March, 1962. photo credit *Képi Blanc*

Inset, right: the North African Security Operation Commemorative medal.

Characteristics, MAS 49-56

calibre	7.5mm
ammunition	7.5mm Model 1929 C
total length	1.015m (40")
length with bayonet	1.235m (48.6")
barrel length	0.500m (19.7")
barrel grooves	4 lefthand
twist	270mm (10.6")
line of sight length	0.570m 22.4")
magazine capacity	10 or 18 cartridges
wt without magazine	4.150kg 9.2 lbs)
wt of 10-rd mag empty	0.200kg (.44 lb)
wt of 10-rd mag full	0.430kg (.9 lb)
wt of 18 rd mag empty	0.285kg (.6 lb)
wt of 18-rd mag full	0.700kg 1.5 lbs)
rifle w/10 rd full mag	4.480kg (9.9 lbs)
practical rate of fire	25 shots/min
practical range	400m (437 yds)
practical range w/scope	600m (656 yds)
useful range	1,200m (1,312 yds)
maximum range	3,500m (3,828 yds)
muzzle velocity	840m/s (2,756 fps)
muzzle energy	323kgm (2,336 ft/lbs)



189. Exploded view of MAS 49-56 trigger group. Compare with fig 141: the housing assembly itself is new, and the triggerguard is larger to avoid finger injury when launching rifle grenades.

The firing mechanism is identical to that of the MAS 49. The trigger pull is a bit lighter: 3.5kg (7.7 lbs) instead of 4kg (8.8 lbs).

Markings

All markings on the receiver are on the left side. As shown in fig 180, the serial number is stamped vertically, followed by the model and calibre.

On the underside of the barrel, by the breech, are stamped in one line the name of the manufacturer, the year of manufacture and the code of the steel supplier. For example:

MAS - 1962 - CSR

CSR stands for *Forges du Creusot, Usine de la Chalassière à St-Etienne* (Creusot Forgings, Chaleassière Factory, St-Etienne).

On the rear of the receiver cover is found the code of the manufacturer and sometimes the month and year of manufacture. Two examples:

MM 8/78

TY

On the right side of the front sight holder, the code of the manufacturer of that part, in relief. For example:

IMT

Documentation

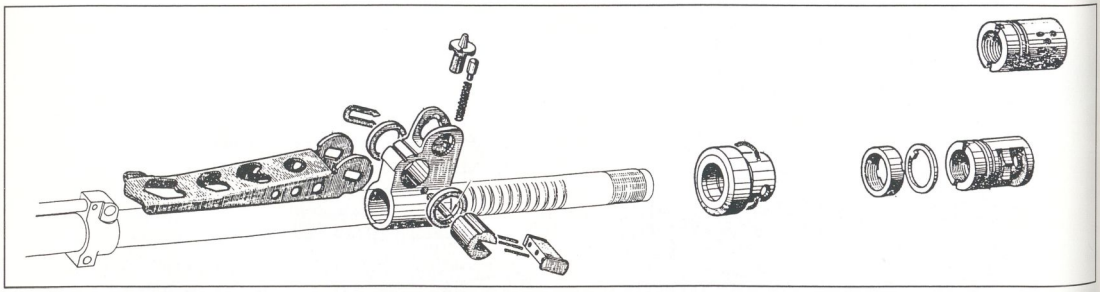
- Concise Technical Guide MAT 1032 (ex MAT 1067)
- Repair Manual MAT 1148
- Illustrated Catalogue MAT 119 (ex MAT 1406)
- Collective Unit Chart MAT 1295

References

- nomenclature number: 1005.14.219.9520
- EMAT code number: 1130.19
- NATO standard number: 1005 14 219 9520

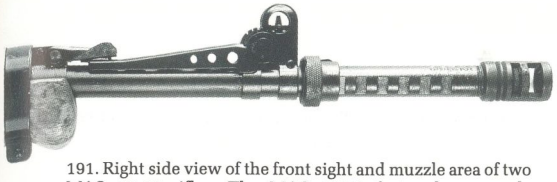
Packing; List of Stores and Equipment

Same as for the MAS 49.



190. The grenade launcher/flash hider assembly of the MAS 49-56. All components are new to this model.

Two types of barrels and flash hiders were produced for the MAS 49-56. Note the type 2 flash hider (upper right).



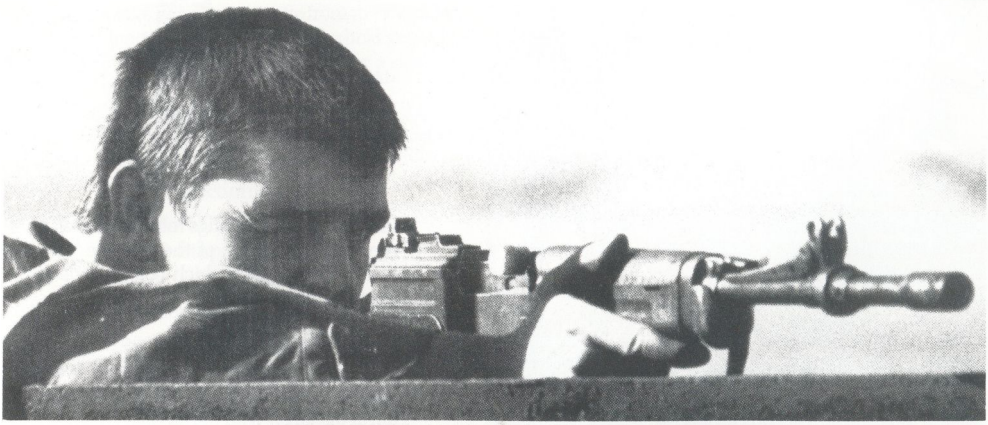
191. Right side view of the front sight and muzzle area of two MAS 49-56 rifles. The MAS 49-56 featured a grenade launcher/flash hider assembly completely redesigned from that of the MAS 49.

Note first type of flash hider on early barrel, (left), which was replaced in 1963 by a second type (right; on late barrel).

Handling the MAS 49-56

192. Keeping the edge: Legionnaires at firing exercises with their MAS 49-56 rifles. photo credit *Képi Blanc*

Inset, right: Insignia of the French *Commandos de l'Air* (Air Force Commandos). Created in Algeria, the unit still exists as the *Fusilier-Commandos de l'Air*, but the insignia itself is no longer used.



193. Not for nothing did the MAS designers devote much time and effort to the form and function of the rear peep sight. The MAS 49-56 is a rifle capable of great precision.

courtesy D R

Handling the MAS 49-56 as a semi-automatic 7.5mm rifle is identical to handling the MAS 49.

However, to adjust the sights of the MAS 49-56, proceed as follows:

For windage, turning the peep sight screw a half turn corresponds to 5cm at 100m

For elevation, turning the front sight one quarter turn corresponds to 5cm at 100m.

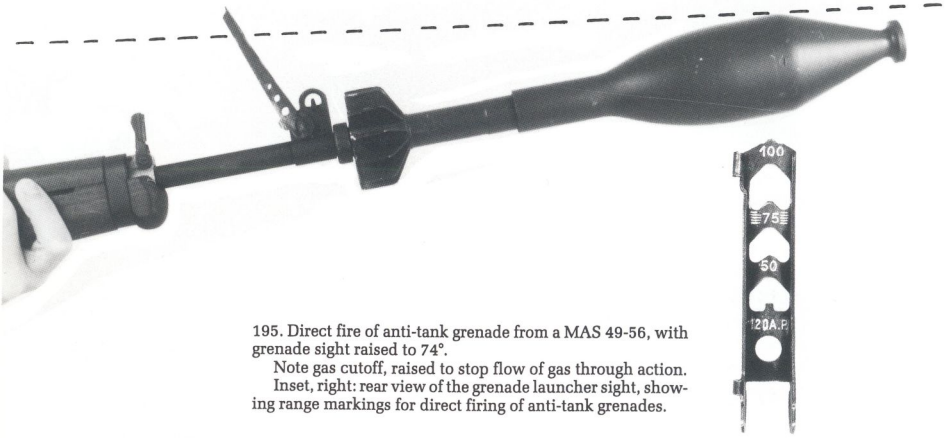
Launching Grenades

194. Top view of the MAS 49-56 muzzle end, showing (folded) grenade sight, and grenade range ring.

Note range graduations on launcher tube, and second type flash hider.

Withdraw the magazine and raise the gas cutoff valve, then follow the steps below:

Direct Fire



195. Direct fire of anti-tank grenade from a MAS 49-56, with grenade sight raised to 74°.

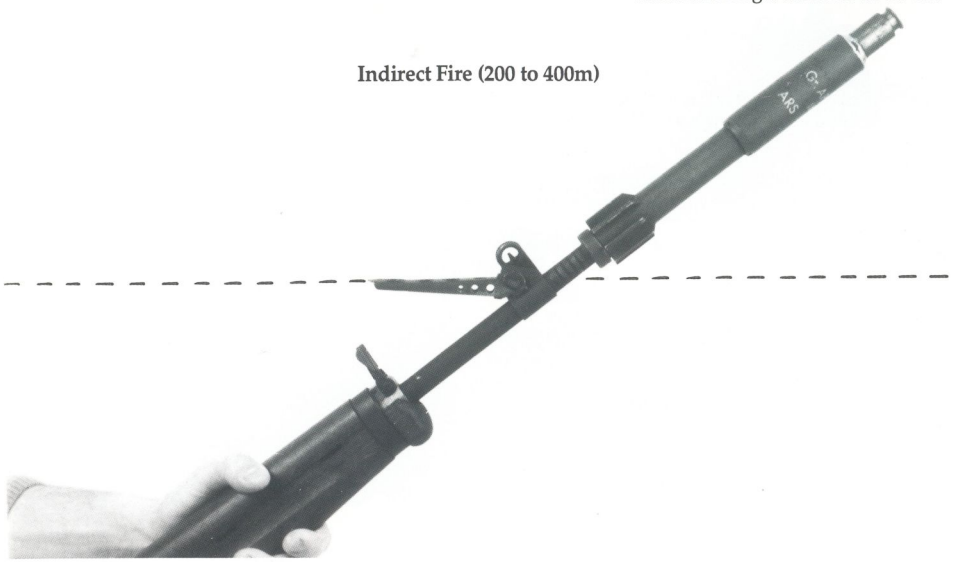
Note gas cutoff, raised to stop flow of gas through action.

Inset, right: rear view of the grenade launcher sight, showing range markings for direct firing of anti-tank grenades.

- Raise the grid to 74°
- Place the grenade support ring at maximum depth
- Introduce the grenade into the launcher
- Withdraw the grenade safety
- Place the special cartridge into the chamber
- Align the upper part of the grenade with the chevron on the grid which corresponds to the distance to the target
- Fire

Indirect Fire (100 to 200m)

- Raise the grid to 74°
- Place the support ring on the real distance to the target
- Introduce the grenade into the launcher
- Withdraw the grenade safety
- Place the special cartridge into the chamber
- Aim at the target with the auxiliary sights on the left side of the grid
- Fire



196. Indirect fire of anti-personnel grenade from MAS 49-56 rifle.

With grenade sight elevated to 45°, aim is taken through the front and rear grenade sights on the left side of the sight grid.

- Raise the grid to 45°
- Place the support ring on half the distance to the target (for example if the target is at 300m, place the ring at the 150m mark)
- Continue as previously.

For direct fire, shooting the rifle from the shoulder is not recommended: the stock should be held securely under the armpit. The sling can be used for a steadier hold.

For indirect fire, do not place the stock on a hard surface. It is best to use the thumb to press the trigger when launching grenades in this position.

Functioning

Same as for the MAS 49.

Stoppages

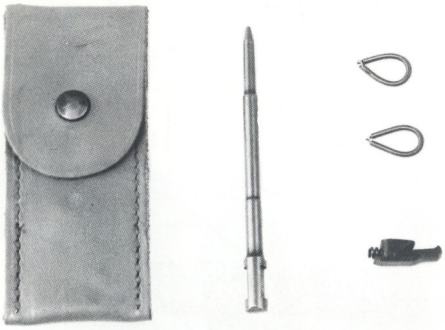
Same as for the MAS 49.

Disassembly and Assembly

Same as for the MAS 49.

197 (right). Troops in the French sector of West Germany in the 1960s, presenting arms with their MAS 49-56 rifles.
courtesy D R

198. Two closeups of the action of a MAS 49-56 instructional cutaway rifle.
Above: right side view, showing details of safety, hammer in resting position, dummy cartridge in chamber.
Below: left side view, showing cartridges in magazine, detail of ejector stop, and trigger group components.



199. Spare parts as issued for the MAS 49-56.
Clockwise from left: spare parts case, firing pin, grenade launcher detent springs, extractor.

Maintenance

Same as for the MAS 49.

Spares

Similar to those of the MAS 49, but with two grenade holding springs included.

The parts, in their own leather case, are carried in the *Modèle* 1958 leather pouch.

Accessories

Very similar to those for the MAS 49, these include:

- four magazines
- one leather sling, model 1936
- one plastic oil bottle, Model 1949 or Model 1962
- one hook-ejector-screwdriver (Type 1 or 2)
- one brass brush, Model 1957 for 7.5mm rifles
- one elbowed silk chamber brush
- one pullthrough, Model 1922 or 1957 modified
- one flat 21mm brush
- one ruptured case extractor
- one leather bag, Model 1958, and a spare parts case
- one Technical Guide, MAT 1032 (ex MAT 1067)
- one night sight device in cloth bag
- one night sight tool
- two models of stock extensions (size 1 or 2)
- one knife bayonet with its scabbard.

200. Cleaning and maintenance accessories issued with the MAS 49-56 rifle.

Top row, from left: plastic oil bottle, *Modèle* 1962; brass brush, *Modèle* 1957 for 7.5mm rifles; ruptured case extractor.

Bottom row, from left: leather pouch, *Modèle* 1958; elbowed silk chamber brush; flat 21mm brush; hook-ejector-screwdriver; night sight tool; pullthrough.

A description of some of these accessories follows:

Luminescent Night Sight Device

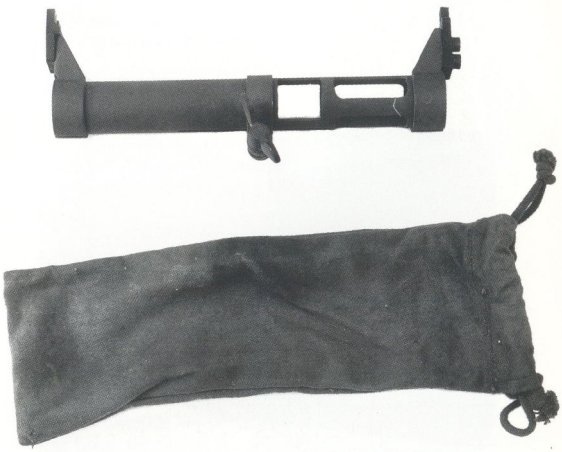
Very similar to the one used on the MAS 49, but cylindrical. It is a tubular sleeve of phosphated sheet steel which also serves as a flash hider. It is fixed on the muzzle brake by a ring and tightened with a wing nut.

It has a 'U'-notch rear sight adjustable for windage; and a front sight adjustable for elevation. Both are luminescent.

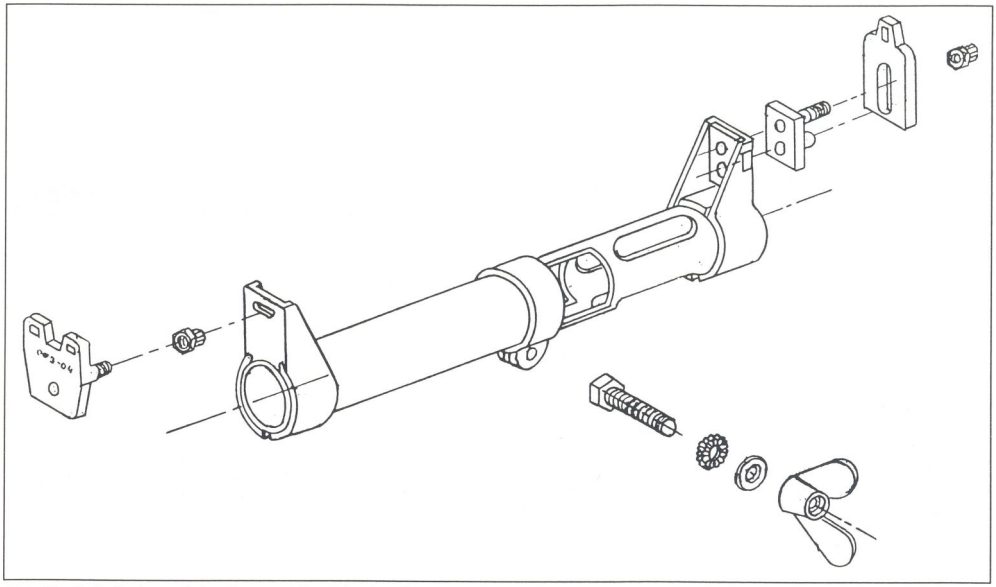
Because the design of the clamp on the original flash hider was defective, the system was redesigned so as to use a hexagonal bolt and a wing nut. A hexagonal key was therefore added to the accessories.

Night sight devices issued to MAS 49 rifles with serial numbers over G 80200 have the new system; the others have been modified.

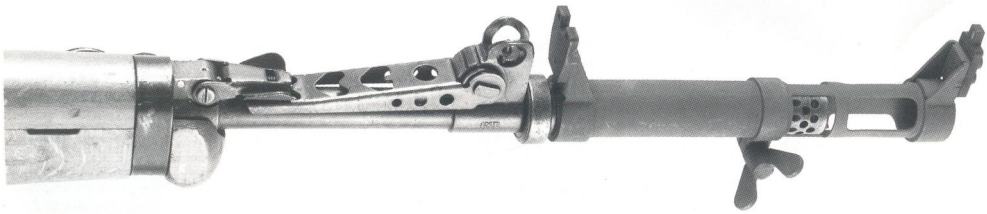
The device is transported in a khaki cloth case.



201. Right side view of the night sight issued for the MAS 49-56, shown with its cloth carrying bag.

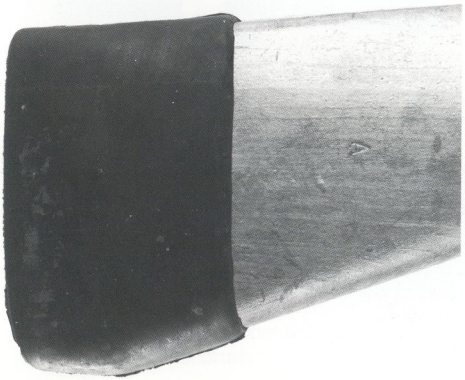


202. Exploded view of the issue night sight for the MAS 49-56. The rear sight notch, framed with two oblong luminescent bars, is adjustable for windage. The luminescent front sight is adjustable for elevation. document MAT 1148



203. The luminescent night sight device, shown mounted over the flash hider of the MAS 49-56 rifle and secured by its central wing nut and clamp.

Stock Extensions

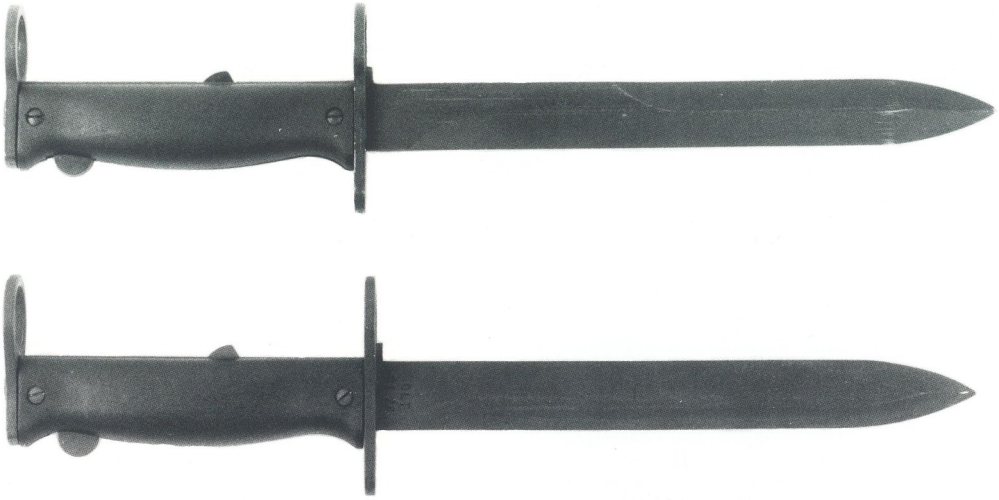


Already planned for the MAS 49, these did not appear until later. They are used when firing with a telescope or when launching grenades. They are made of black rubber in two thicknesses and issued as follows:

- size 1 (+ 2cm/.79"), for average-sized shooters (75%)
- size 2 (+ 3.5cm/1.4"), for larger shooters (25%).

204. Right side view of the rubber stock extension, issued in two thicknesses as in the text above.

The MAS 49-56 Bayonet Knife



205. Two models of bayonet issued for the MAS 49-56, as described in the text, below.
Above: bayonet *Modèle* 1956. Note US Carbine-style blade, half-sharpened on upper edge.
Below: bayonet, *Modèle* 1958. Slightly shorter blade, with thicker upper edge sharpened at the point only.

206. Right side view of the bayonet, *Modèle* 1956, shown mounted on the MAS 49-56 rifle.

There are two very similar models:

Model 1956 Bayonet

This is a knife bayonet with a 220mm (8.7") double-edged blade with an asymmetrically curved tip. The blade extends through the handle and is riveted to a 'U'-shaped stamped steel tang. The handle is contoured, with two black plastic grips fixed by brass screws.

The cross and back guards have 22mm-diameter rings. Both rings serve to fix the bayonet to the rifle. A lever inside the grip catches onto the muzzle brake. Before fixing the bayonet, it is necessary to push the grenade ring all the way in.

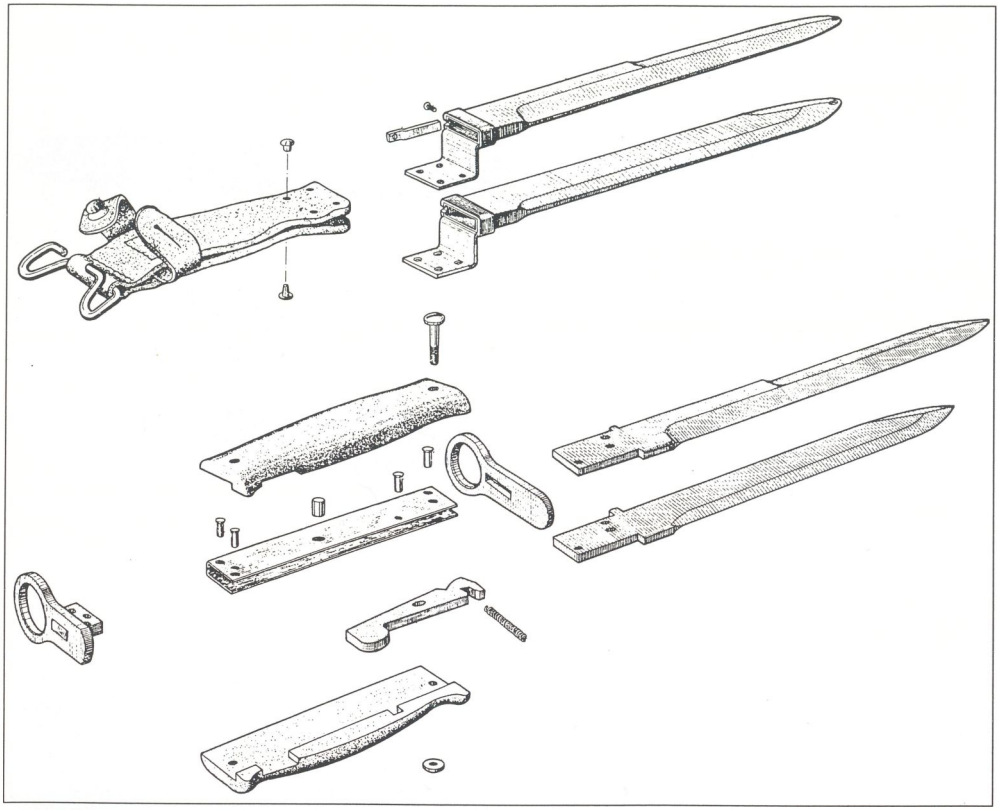
The scabbard is made of phosphated sheet steel, to which is riveted a fawn-coloured leather frog with a belt loop. A leather strap holds the bayonet by the handle.

The bayonet alone weighs 220g (.44 lb); with scabbard 500g (1.1 lbs).

This version was delivered with MAS 49-56 rifles serially numbered up to 40000.

Model 1958 Bayonet

The Model 1958 is practically identical to the above, but some blades are shorter (200mm/7.9"). On these the slant of the edge has been changed and the double edge has been shortened to reduce manufacturing opera-



207. Exploded views of MAS 49-56 bayonets and scabbards, showing details of construction and differences between models.

Clockwise from top left: leather frog and rivets; scabbard, *Modèle* 1956; scabbard, *Modèle* 1958; blade, *Modèle* 1956; blade, *Modèle* 1958; crossguard; grip and catch assembly; backguard. document MAT 1199

208. Skirmishing with the bayonet fixed. Note the cartridge pouches.

tions. The scabbard has been slightly modified so as to accept the new blade profile, but the length remains the same. Other elements remain unchanged.

The frog is in fawn or khaki leather.

The Model 1956 bayonet is the only one which can use both scabbards: the Model 1958 with its thicker, unsharpened upper edge will only fit into its own scabbard. Jamming a Model 1958 blade into a Model 1956 scabbard often results in the blunt point splitting the scabbard.

MAS 49-56 bayonets do not have serial numbers. Certain parts of the bayonet have been subcontracted to private industry. On the crossguard and the scabbard, one or other of the following markings can be found:

D-RM

E-RM

E HF

MAT

F

MAS (followed by the year)

GIAT (sometimes on the blade)

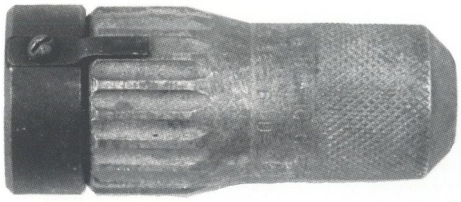
Cartridge Pouches

The cartridge pouches used with the MAS 49-56 are identical to those used for the MAS 49. A project to manufacture cloth pouches for common issue to all services was begun in the early 1970s but was not continued, as the new 5.56mm assault rifle was about to be adopted.

209. Soldier armed with a MAS 49-56 on firing manoeuvres during the 1970s. courtesy D R

Ancillaries

Blank Firing Device



210. Blank firing device for the MAS 49-56 rifle.

The muzzle of the MAS 49-56 rifle will accept a cadmium steel blank firing device. This ancillary ensures the semiautomatic functioning of the rifle with special blank cartridges.

This is a garrison accessory, delivered on a variable percentage depending on unit operations.

211. Catching a few moments' rest with rifle held ready: on exercises with the MAS 49-56, blank firing adapter installed.

212. Soldiers on training exercises disembark from a VTT (*Véhicule de Transport de Troupes*; Armoured Infantry Fighting Vehicle) AMX 13. courtesy D R

The Visoscope

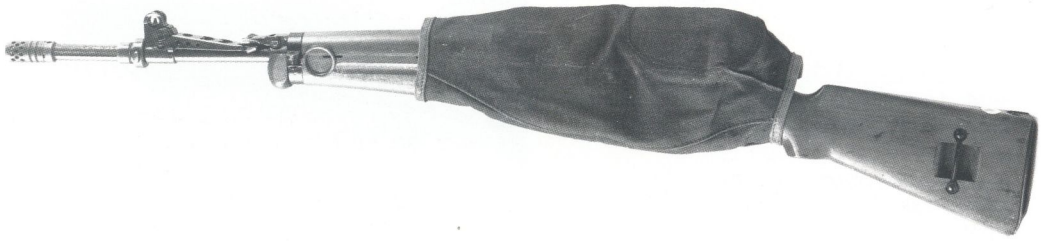
213. The Visoscope, an angled mirror which clips over the rear sight and permits the instructor to view the sight pattern of the recruit.

Shown mounted on a MAS 49-56 MSE Competition Rifle, described below (fig 233).

The Visoscope is a small mirrored accessory of US origin, originally designed for use with the M1 Garand rifle. It permits the instructor to see if the pupil is aiming correctly.

It is made up of thin sheet steel, phosphated, placed close to the peep sight. It does not bother the shooter, who can aim while the instructor verifies if sights are correctly aligned on the target.

Transport Cover



214. The MAS 49-56 rifle in its Transport Cover. This MAS 49 accessory was used with the MAS 49-56 only when serving in desert conditions or when making parachute jumps.

This accessory, originally part of the UC (*Unité Collective*; accessory kit) for the MAS 49, is no longer used with the MAS 49-56. Nevertheless, some units have kept it for specific missions (parachuting or movement in desert zones).

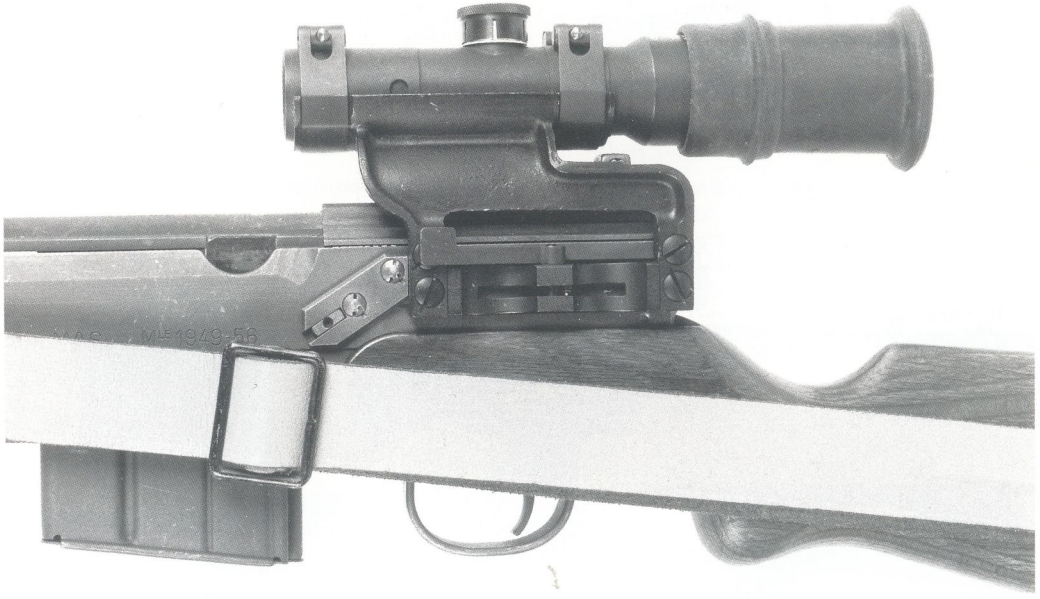
This cover will protect the central part of the rifle against impact and the introduction of dust and dirt. It is made of a thick, khaki-coloured canvas cloth, and closed by a leather lace going through metallic rings.

Telescopic Sight *Modèle* 1953

215. Two views of the *Modèle* 1953 Telescopic Sight mounted on the MAS 49-56. The *Modèle* 1953 is the same scope as used with the MAS 49. It is described in Chapter Seven.

Above: right side view of sniper rifle with black rubber stock extension and telescopic sight. Such rifles, chosen for their accuracy, would not normally be called upon to launch grenades, although they retain that capability.

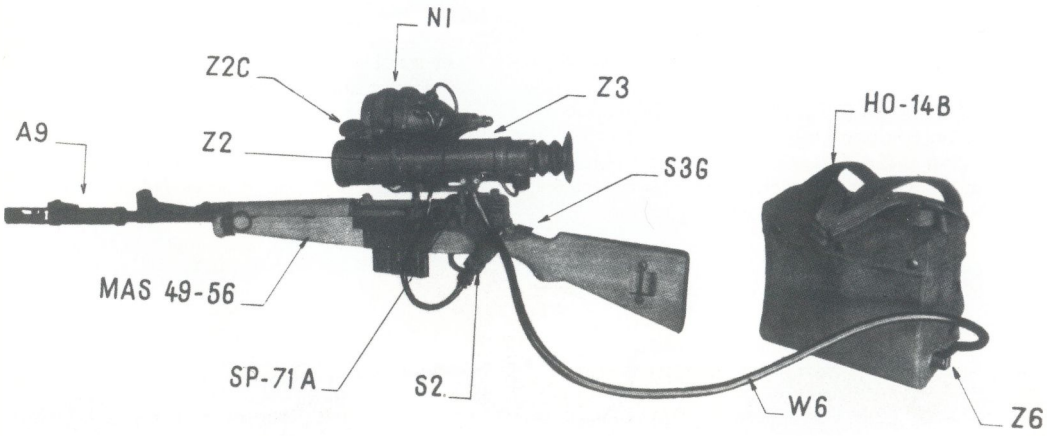
Below: left side closeup of the receiver, showing details of mount.



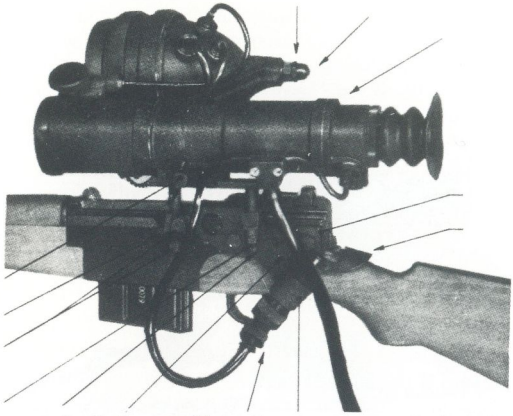
216 (above). Sighting-in a telescope-equipped MAS 49-56, in Algeria. photo courtesy C C

Inset, right: insignia of the *Commandos de Chasse* (Hunter-Commandos). These were special units derived from Sector (billetted) troops and used as Interventionist (airborne) troops in Algeria. These units no longer exist.

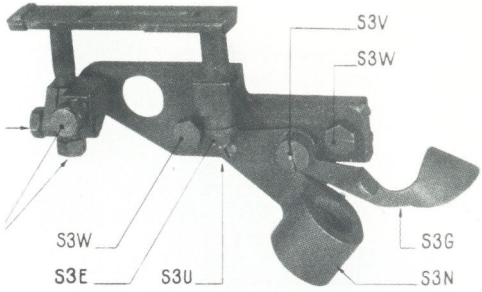
The Infra-Red Night Sight DI - PT



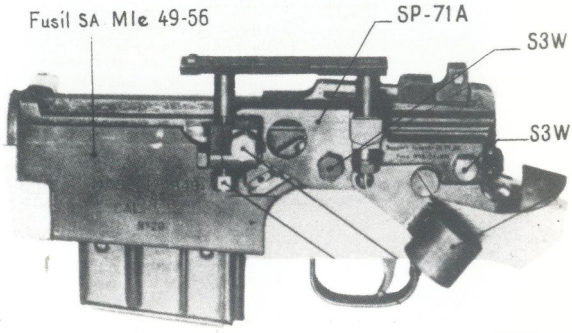
217. Infra-red (active) night sight DI - PT mounted on a MAS 49-56 rifle, with equipment. courtesy EMA-ARMET



218. Left side closeup of the night sight with integral infra-red light source. These bulky early units required large battery packs (HO 14B, above) and were easily detectable through an infra-red light viewer. courtesy EMA-ARMET



219. Mount, Telescopic Sight, SP-71A showing activating switch holder (S3N) and thumb-activator (S3G). courtesy EMA-ARMET



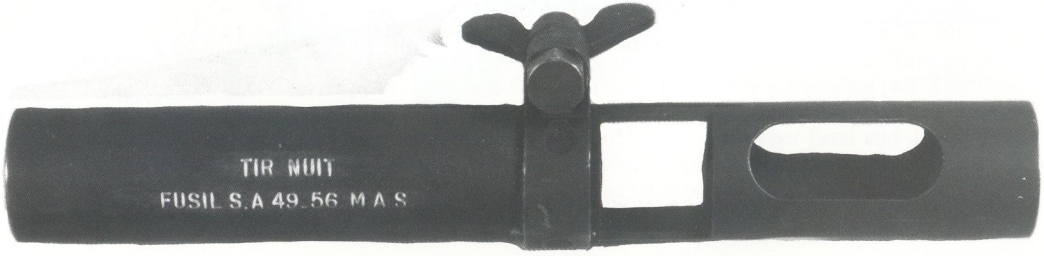
220. Left side view of MAS 49-56 receiver showing method of permanent attachment of Mount, SP-71A with Bolts, S3W. courtesy EMA-ARMET

This device exists in many variants, as follows, all manufactured in small numbers:

Model	Quantity
DI-PT 2A	100
DI-PT 2B	50
DI-PT 2C	560
DI-PT 5A	35
DI-PT 5C	quantity unknown

The DI - PT infra-red night sight was composed of:

- a fixed power (1.4 x) scope, with a 15° angle of vision, permitting fire up to 150m.
- an infra-red projector with an 8° angle equipped with a 35-watt lamp with a luminous intensity equivalent to 35,000 candlepower.
- a set of 6-volt cadmium-nickel batteries with a vibrator and a transformer, providing 10,000 volts secondary tension. The batteries are carried in a knapsack. They provide two hours of continuous illumination, or five hours of intermittent use. Total weight of the equipment is 16kg (35¼ lbs).

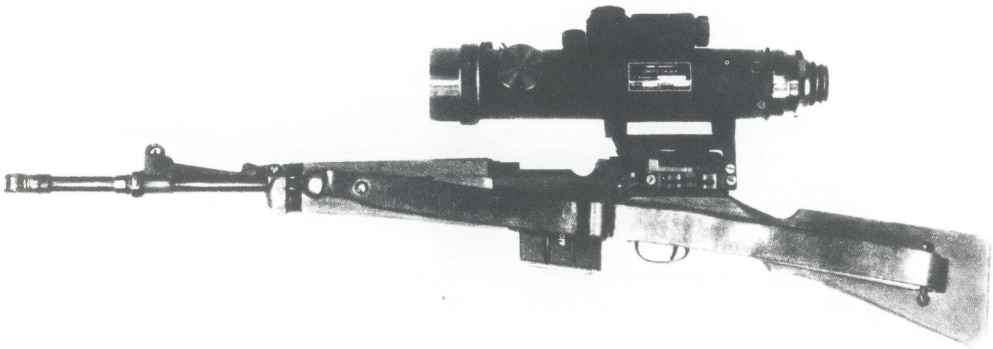


221. The special flash hider (A9, fig 217) to minimise flash for night shooting.

222. A soldier, armed with an infra-red night-sighted MAS 49-56, surveys the terrain. courtesy D R

- a base for the scope and the projector, which remains permanently mounted on the rifle to which the equipment is issued.
- a flash hider in sheet steel, mounted on the muzzle while the night firing device is used.
- a transportation case in aluminum for the telescope, the projector, the batteries, the flash hider and a tool bag.

The SOPELEM Light Intensifying Scope



223. MAS 49-56 rifle equipped with a SOPELEM light-intensifying night or "starlight" scope. courtesy D R

Light-intensifying scopes, also known as "starlight" scopes, first appeared during the 1960s. They are called "passive" light-intensifiers in that they work with available light and do not shoot out the telltale infra-red beam of earlier, "active" night scopes. This passive night equipment permits observation and aimed fire in the dark, using only moonlight or starlight as illumination.

In France, the SOPELEM company made such an assembly, which could be fitted to individual weapons. It was composed of a 4 power telescope with a ten-degree field which allowed firing up to 300m. The set weighed 2.7kg (6 lbs).

With the advent of the Vietnam War this sophisticated technology blossomed with incredible speed. First-generation equipment soon gave way to second- and third-generation vibratorless products such as the SOPELEM OB 50, which perform better, are much more rugged, and weigh one-third as much. However, these did not arrive in time to be used with the MAS 49-56.

Manufacture and Serial Numbering

224. Left side closeup of a demonstration MAS 49-56 rifle, XXXX series.

From 1957 to 1978, 275,240 MAS 49-56 rifles were manufactured and numbered as follows:

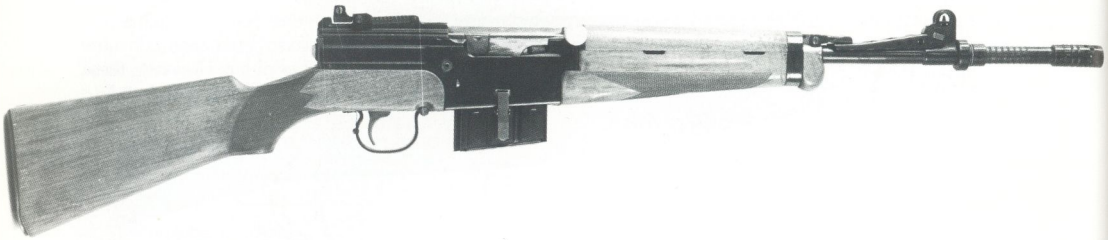
- 100,000 numbered F 001 to F 100000
- 100,000 numbered G 001 to G 100000
- 75,240 numbered H 001 to H 75240

As the MAS 49-56 was progressively issued, the French Army was not uniformly and completely equipped with 7.5mm rifles until the middle 1960s.

There were also some demonstration rifles with 'X'-ed out serial numbers which are not considered in the above numbers. These rifles are in the hands of units under the Instruction Code AMAT A 200 and are designated INSTRUCTION RIFLES. They are pierced with three 8mm holes on the upper part of the breech; the firing pin point has been cut, a white stripe has been painted around the upper band and a 12mm 'X' is engraved on the receiver and on the stock and then painted white or red.

Variants

MAS 49-56 "de Luxe" Version

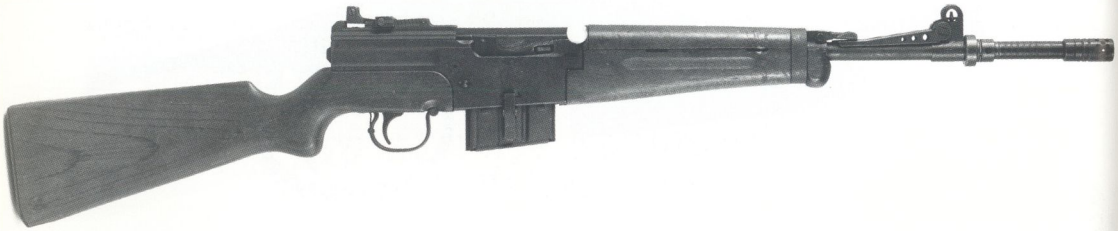


225. Right side view of the MAS 49-56 "de Luxe". Note the checquering on the pistol grip and forestock. All metal parts are finished in high-gloss blue, except the bolt and carrier, which are chrome plated.

At the St-Etienne factory Museum there is a MAS 49-56 in the de Luxe version. All the metal parts are finished in a high-gloss blue except for the bolt assembly, which is polished and chromed.

The stock is walnut, the parts on the grip and the forend which serve to hold the rifle are checquered.

MAS 49-56 in 7.62mm NATO



226. Right side view of a MAS 49-56 rifle in 7.62mm NATO calibre. This example is fitted with a laminated buttstock.

As with the MAS 36-51 rifle, FM 1924-29 machine rifle and the MAS 31 machinegun, the MAS 49-56 was also tested in 7.62mm NATO calibre.

In the 7.62mm NATO calibre MAS 49-56, everything was identical to the 7.5mm model except for the redimensioned bolt head, and the firing pin, made of aluminum with a steel point. The firing pin alteration was necessary in order to avoid inertia fire problems, because the NATO primer is more sensitive than the French 7.5mm primer.

Some examples of this version are fitted with a laminated stock, and others had an unusual semi-pistol grip stock.

The serial number is stamped on the left side of the receiver, as well as on a bevel machined on the rear of the receiver cover, hehind the rear sight.

According to information received, serial numbers started at No 100 and about 150 MAS 49-56 NATO-calibre rifles were produced. The highest number seen is No 205.

The calibre is engraved on the left face of the receiver and it is repeated with an electric pencil on the bolt as "7.62 N".

The Ministry of the Interior tested a version of this rifle with a reinforced stock and a grenade launcher made for launching tear-gas grenades.

227. Left side closeup of 7.62x51mm NATO calibre MAS 49-56 rifle, serial no 112, showing markings. Only about 150 NATO-calibre MAS 49-56s were produced.

The Folding-Stock MAS 49-56 CR (*Crosse Rabattable*) 59 and 60

An Initial Attempt: the MAS 49-56 CR 59

Upon a request from parachute units, the St-Etienne factory made a MAS 49-56 with a folding stock called the MAS 49-56 CR 59. This version was improved and became the MAS 49-56 CR 60.

The Improved MAS 49-56 CR 60

228. Two versions of the folding-stock MAS 49-56 CR 60.

Above: early model, with a short length of thick rubber tubing as the buttplate.

Below: definitive model. The stock is a rubber-coated tube with a sheet steel buttplate fitted with a rubber recoil pad.

Note the larger triggerguard of the "soft trigger" assembly (explained in the next chapter) in the lower rifle.

229. Left side view of the MAS 49-56 CR 60, showing stock folded.

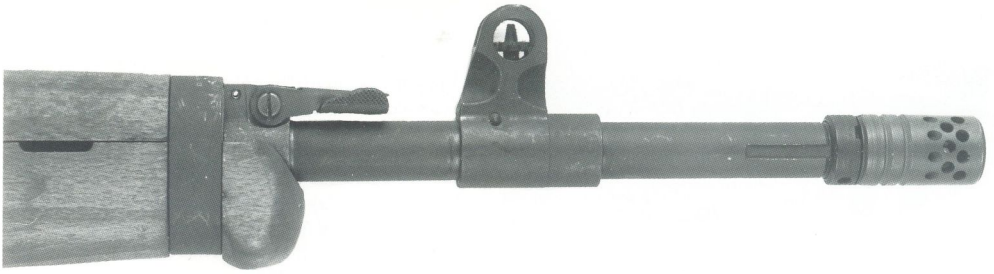
230. Two closeups of MAS 49-56 CR 60 serial no 11.
Above: left side view, showing markings and details of hinge mechanism.

Below: right side view. Once positioned, the vertically-swinging folding stock of the MAS 49-56 CR 60 is clamped by means of a wing nut, located above and to the rear of the pistol grip.

Initially, the CR (folding stock) model was supposed to have had a shorter barrel with the front post placed further away, for a longer line of sight. Finally, however, the barrel of the standard MAS 49-56 was used.

Replacing the buttstock at the rear of the receiver is an aluminum block, anodised black. Onto this block is bolted a wooden pistol grip and a wire stock, which folds vertically after unscrewing a wing nut on the retaining pin.

The stock is made of a rubber-coated tube with a sheet steel buttplate fitted with a rubber recoil pad. (The original model had a short length of thick rubber tubing as the buttplate). The rifle can launch grenades occa-



231. The MAS 49-56 CR 60 was not equipped with a grenade sight or adjustable launcher, but did have the gas cutoff valve, and so could if required launch the occasional grenade from its 22mm diameter flash hider.

sionally, but it does not have an adjustable launcher ring nor a grenade sight. The front sight post base serves as a grenade rest.

The bayonet can be fixed to the rifle.

The MAS 49-56 CR 60 was officially approved but it was never mass produced. It could have been made in 7.5mm or 7.62mm NATO, but the ones that the author inspected were all chambered for the NATO round.

The MAS 49-56 MSE (Modified St-Etienne) Competition Rifle

232. Right side view of the MAS 49-56 MSE (Modified St-Etienne) Competition Rifle, adopted in 1968.

During shooting matches organised among NATO member countries, France took all the prizes with the FR F1 sniper rifle. The US complained that the French were using a sporting rifle, not a military weapon.

General Staff EMAT Code Number 1130.20 requested St-Etienne to develop a version of the MAS 49-56 rifle, expressly for competition. The new rifle was named MAS 49-56 MSE (Modified St-Etienne).

The MAS 49-56 MSE was adopted in 1968. Examples were both newly manufactured and made up from reconditioned rifles. Three thousand were ordered but only 900 were delivered, as follows:

3,000 were ordered but only 900 were delivered, some newly manufactured and some made up from reconditioned MAS 49-56 Service rifles.

233. Legionnaires of the 13th DBLE at Djibouti, during the 1970s. photo credit *Képi Blanc*

234. The Flag of the the 2nd REP (*Deuxième Régiment Etranger de Parachutistes*; 2nd Foreign Legion Paratroop Regiment) being ceremonially returned to France from Algeria. Founded in Indochina as a Battalion, the 2nd REP later became a Regiment. This unit still exists.

The location is unclear but could be a Navy airbase: note the "Neptune" anti-submarine aircraft, visible at left.

photo credit: *Képi Blanc*

Inset, above: triangular dragon Insignia of the 2nd REP.

- 100 to the Army
- 260 to the Air Force
- 220 to the *Gendarmerie*
- approximately 300 for export

For converting existing rifles, a transformation "kit" was made by MAS for assembly by MAS, MAT and *Etablissement Régional du Matériel* (ERM); an Ordnance repair plant in Poitiers, whose name has recently been changed to ETAMAT.

The MAS 49-56 MSE was modified as follows:

- an ergonomic stock with synthetic cheek piece (two heights: 8 and 17mm)
- a pistol grip
- the peep sight and front sight were finely adjustable, each click corresponding to a movement of one fourth of a thousandth (2.5cm at 100m)
- trigger travel was diminished and trigger pull reduced to 2.5/2.8 kg instead of 3.5kg.

The Competition rifle should not fire blank cartridges, reduced charge ammunition nor grenades.

Each MAS 49-56 MSA could be reconverted to a MAS 49-56 if necessary: the original stock and the rear and front Service sights were kept in its kit case.

The 1.5-Scale Educational Model

235. The 1.5-scale MAS 49-56 educational rifle, made entirely of iron and light alloy castings and cut away to demonstrate functioning. The model is 1.54m (5') long, and weighs 15kg (33 lbs).

A real MAS 49-56 is positioned underneath to show scale. Note the distinctive, late-issue "soft" trigger.

A model of the MAS 49-56 enlarged to 1.5x scale was produced for the instruction of recruits. It is made entirely of moulded metal alloys, using iron castings, zamak, and bronze. Cutaway areas permit viewing the mechanism as it functions. Cast numbers identify each of the principal components. The buttstock and forend are painted brown, the other elements are painted black, but certain internal cuts are painted in bright colours for ease of identification.

Other scaled-up training weapons that have been made include the MAT 49, FM 1924-29 machine rifle, and the AA 52 machinegun. These models have been made under contract by private industry, notably the BROUEL Factory in Courbevoie.

The Civilian MAS 49-56

In France, with some exceptions, civilian shooters cannot own weapons that fire military cartridges. For this reason, the MAS 49-56 had to be rechambered before sales to the public could be contemplated.

The cartridge chosen was a "wildcat" called the .284-.30. It uses the case of the .284 Winchester Magnum, with its mouth enlarged to .30" (7.62mm).

The transformed rifle has the following differences:

- larger chamber
- modified bolt face
- modified locking ramps
- modified gas system
- grenade rest ring eliminated or blocked
- muzzle brake reduced by 1mm to prevent fixing a bayonet
- rear sight slide limited to 300m
- magazine capacity limited to two rounds by a crosspiece.

Phasing Out the MAS 49-56

With the adoption of the 5.56mm FAMAS rifle in 1979, the MAS 49-56 was slowly withdrawn from service, first from front line troops, then from all active units in the Army. At the time of this writing, it still is in the hands of the Navy and reserve units. Certain African countries have received small numbers of MAS 49-56 rifles.

236. The 5.56x45mm NATO-calibre FAMAS, the totally redesigned hesitation-lock bullpup which has replaced the 7.5mm MAS system in front-line French units.

photo MAS

237. Verification of a series of 214 MAS 49-56 rifles, performed at the Centre of Instruction of the Armoured Cavalry of Carpiagne in 1980. The inspections are being carried out by Commandant Pedrassi, *Officier Contrôleur* APC/MB of the Technical Control Detachment of the 5th Military Region, under the watchful eye of the Chief Armourer.
collection Alain Tomei

Chapter Nine

Servicing 34 Years of Production

Notes on Model Interchangeability

In the French Army, armourers in charge of repairs to the MAS 44, MAS 49, MAS 49-56 and MAS 49-56 MSE rifles have at their disposal a number of spare parts catalogues (which give spare parts nomenclature and ordering codes), and Repair Manuals (which show in detail the procedures to be followed in each repair operation or adjustment).

This is just as well, for the MAS series was in production over a period of thirty-four years (from 1945 to 1979) during which time, as we have attempted to show, a number of parts were modified in order to fix certain faults, add, improve or remove certain features, or lower manufacturing costs.

In general, there is total interchangeability. In fact, to ease the burden on the supply system certain early parts were used until stocks were exhausted before parts for the following model were issued. As a result, it is rare to find a MAS 44 or MAS 49 in "original" condition.

The Stock

All production models except the MAS 49-56 MSE (Modified St-Etienne Competition Rifle, discussed in Chapter Eight) use the same stock. The buttplate, the sling bar and the sling are the same as on the bolt-action MAS 36.

The MAS 49-56 can also be found with a laminated wood stock (notably on the 7.62 NATO versions). This was done as a test to verify if laminated wood withstood grenade firing better than the standard beech. Although the laminated stocks proved stronger, their cost was much higher, and therefore the project was abandoned.

Bolt Assembly

When the supply of MAS 44 bolt carriers with riveted sideplates was exhausted, these rifles were repaired with MAS 49 bolt carriers, with dovetailed sideplates.

Trigger Assembly

MAS 49 and the first MAS 49-56 rifles were originally fitted with a trigger pull measured at 4kg (8.8 lbs). Later, this assembly was substituted for what was called a "soft trigger", measured at 3.5kg (7.7 lbs). Stocks of the original model were exhausted before "soft trigger" assemblies were made available for repairing rifles.

MAS 49-56 MSE rifles are fitted with a special trigger assembly marked 'M', wherein the trigger pull has been reduced to 2.5 - 2.8kg (5.5 - 6.2 lbs).

Barrels

The first MAS 49-56 were delivered with barrels having milled notches for the grenade rest ring. For reasons of economy, later models had lathe-cut notches.

The ears of the front sight protector on the first series MAS 49-56 rifles were found to be too flimsy. When dented or bent they had to be bent back with the use of an anvil and a special jig (fig 255). The latest rifles had a more robust protector.

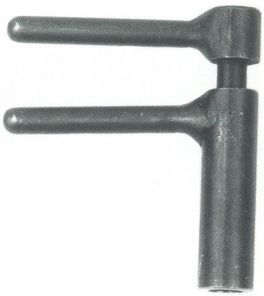
Overhaul, Repair and Adjustment

As noted, in the French Army the individual soldier was not allowed to service his MAS rifle beyond rudimentary field stripping and cleaning (fig 153). When repair or replacement of a component became necessary, the rifle was returned to Base Workshops or Armoury level, depending on the complexity of the operation involved, where the considerable number of special jigs, fixtures, tools and gauges necessary to support the various iterations of the MAS rifle system were available.

These basic operations involve gauging and component removal and replacement, as described hereunder:

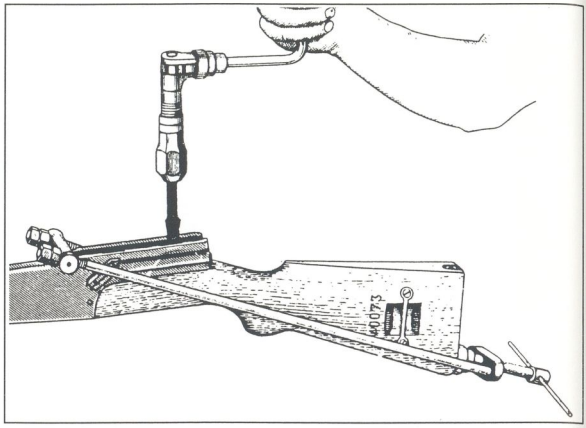
The Stock

As might be thought for a grenade-launching rifle, the MAS buttstock is held quite securely onto the receiver. Removal of the triggerguard screw without damaging its sheet-metal bridle requires the use of a special tool (fig 238).



238. The special tool necessary to unscrew the triggerguard screw, while holding down the sheet-metal bridle, riveted to the rear of the triggerguard.

The replacement of the stock requires the use of a special joiner's clamp (fig 239). The screw which serves to fix the attachment bushing must be blocked by a brace.



239. With the buttstock held securely in the special joiner's clamp, the buttstock screw is threaded into its bushing by means of a brace and bit.

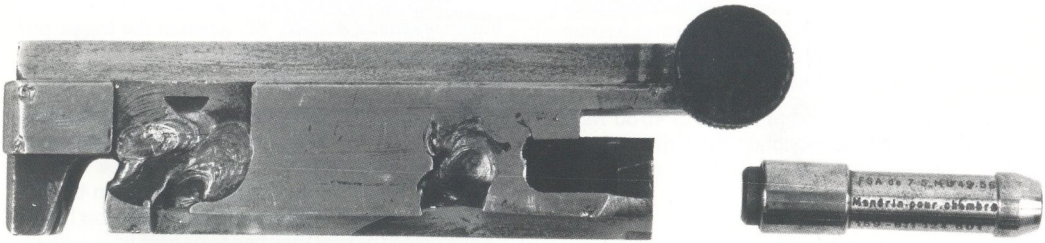
document MAT 1148

The rifle's serial number should be found stamped vertically on the stock near the sling bar (figs 146, 239); although on reconditioned rifles it could have been obliterated.

If necessary, a wood mill is used to trim the stock interior where the hammer passes.

240. Wood mill, used to trim replacement stocks of any slight interferences.

Headspacing the Bolt Assembly

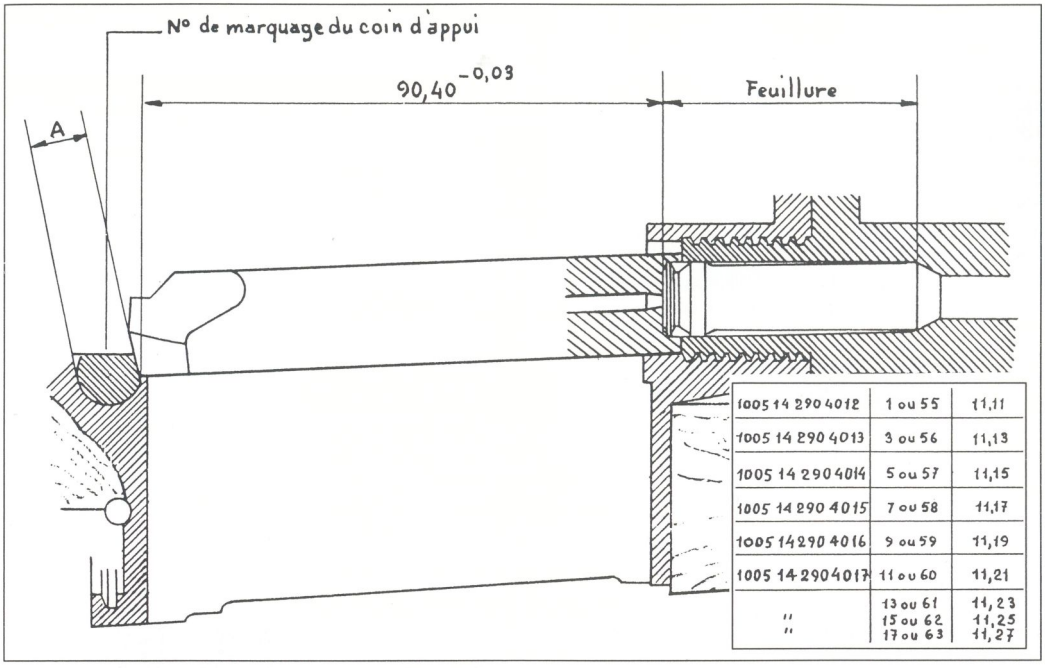


241. A slave assembly made from a bolt carrier (with side-plates removed) with a stripped-out bolt welded inside in the unlocked position. Used in conjunction with the chamber entrance gauge, right, to check chamber throat dimensions.

To compensate for wear, six bolt sizes and 25 headspace pins (locking shoulders) were available for the MAS 49, as follows. These were matched until a headspace of between 42.6 and 43.00mm was obtained:

- 6 bolt sizes (90.35 to 90.40mm in hundredths)
- 25 headspace pins (10.97 to 11.31mm in two hundredths)

The MAS 49-56 and the MAS 49-56 MSE used only two types of bolts, and ten headspace pins. Rifles up to number H 14620 used the first type bolt, and later production used the second. Second-type bolts have arched, headless ejector pins, and are identified by the letter 'O'. The second model firing pin is polished, not phosphated. All first-type bolts have, in principle, been changed, as the first-model firing pin should not be used in a second-type bolt, and vice-versa.



1005 14 290 4012	1 ou 55	11,11
1005 14 290 4013	3 ou 56	11,13
1005 14 290 4014	5 ou 57	11,15
1005 14 290 4015	7 ou 58	11,17
1005 14 290 4016	9 ou 59	11,19
1005 14 290 4017	11 ou 60	11,21
"	13 ou 61	11,23
"	15 ou 62	11,25
"	17 ou 63	11,27

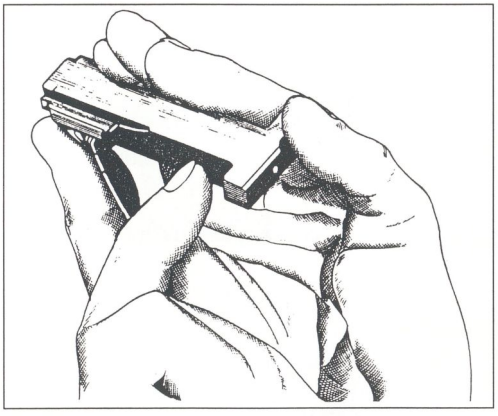
242. Verification and adjustment of headspace of rear-locking, tilting bolt, in use since the MAT 1926 and MAS 1928.

The distance 'A' (upper left) varies according to the number of the headspace pin employed.

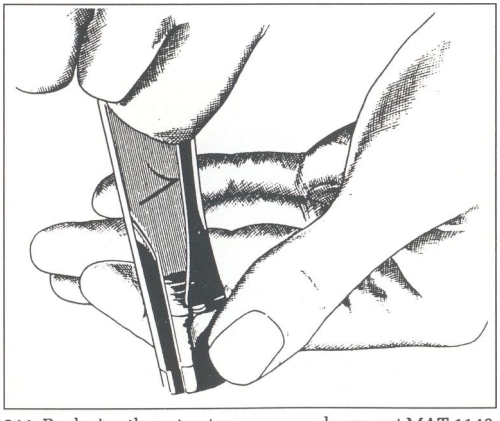
Inset: chart of 18 available headspace pins. Columns, from left show: NATO stock number, headspace pin number, dimension of 'A' in millimetres.

Bolts in service before 1960 are marked as follows to indicate their allowable longitudinal dimensional variation ($90.40^{-.003}$mm): 90.37 '3'; 90.38 '4'; 90.39 '5'; 90.40 '6'.

document MAT 1148



243. Removing the extractor. document MAT 1148



244. Replacing the extractor. document MAT 1148

Bolt Gauges

As shown in fig 245, there are a number of inspection gauges which allow the armourer to quantify the amount of wear the bolt and its aligned components have experienced:

- headspace gauges (42.6mm minimum for MAS 49; 42.65mm minimum for MAS 49-56. 42.8mm intermediate; 42.9mm construction reject and 43mm service reject)

245. MAS rifle headspace gauges, shown actual size. From left: min (42.65mm); inter (42.80mm); inter (42.90mm); reject (43mm).

- hammer protrusion pump gauge (0.8mm minimum; 1mm maximum)
- extractor claw height gauge (1.65mm minimum; 2.2mm maximum; 2.3mm reject)
- firing pin protrusion gauge (fig 247) 1.3mm minimum; 1.8mm maximum
- firing pin channel gauge (fig 248) 2.6mm max
- chamber entrance gauge (fig 241).

The bolt carrier must have a maximum length of between 123.3 and 123.7mm.

Removal of the side plates of the bolt carrier will destroy them. They must be replaced by new side plates, seated with a special tool (fig 246).

The cocking handle is fixed by a riveted pin.

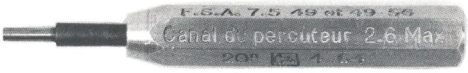
Replacement of the recoil spring guide and the receiver cover lock requires special tooling.

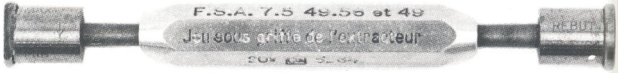
246 (above). The special burin used to seat new bolt carrier sideplates.

247 (right). Closeup of firing pin protrusion gauge for MAS *Modèles* 1944 and 1949.

Note 1.3mm minimum (top); 1.8mm maximum (bottom).

248 (below). Maximum 'go' gauge (2.6mm) for verification of firing pin hole in bolt.





249. Go (left)/No-go (right) gauge to verify the extractor claw overhang.

Trigger Assembly

250. The MAS "soft trigger" assembly, a remarkably compact and well-designed assembly. Trigger pull measured at 3.5kg (7.7 lbs).

As noted, MAS 49 and the first MAS 49-56 rifles were originally fitted with a trigger pull measured at 4kg 8.8 lbs). Later, "soft trigger" assemblies were made available for repairing rifles.

The "soft trigger" assemblies differ from the original as follows:

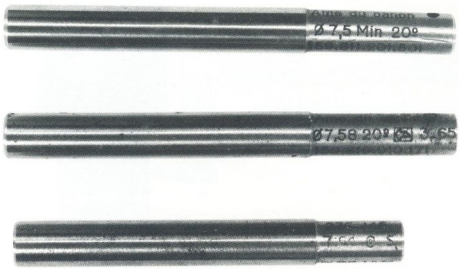
- a larger trigger guard, allowing the use of gloves when firing and not hurting the finger when launching grenades
- a longer (by 7mm) trigger with a different profile
- a redesigned sear nose
- a longer triggerguard screw bridle
- a new sear spring in 0.7mm wire instead of 0.8mm, with ten turns instead of eight
- a differently-shaped trigger spring.

Inspection gauges include a trigger pull gauge, a spring measure, and a hammer protrusion gauge.

The Barrel

Cylindrical barrel gauges exist in different sizes (7.5mm mini; 7.54mm intermediate; 7.58mm construction reject; 7.61mm service reject). Replacement of a barrel is only done at the Armoury level, with tooling specially designed for this purpose. This operation is necessary if the barrel is deformed, if the chamber is pitted or if the bore is worn out (the 7.61mm service reject gauge should not pass).

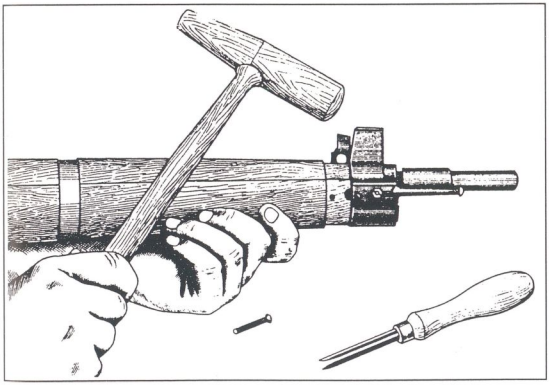
New MAS 49 barrels are intentionally supplied with a high front sight, which must be filed down.

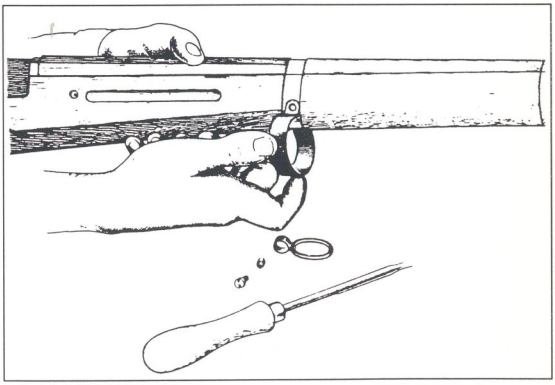


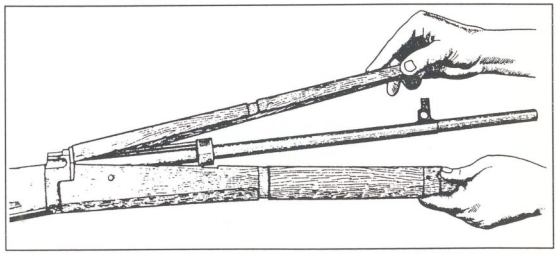
251. Barrel bore gauges. From top: 7.5mm minimum; 7.58mm construction reject; 7.61mm service reject.

252 (right). Punch (left) and jig (right) used to reform the front sight 'ears' when bent or damaged.

Fittings





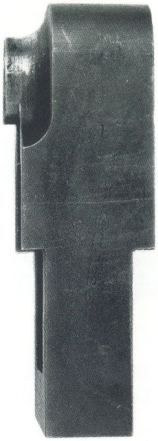


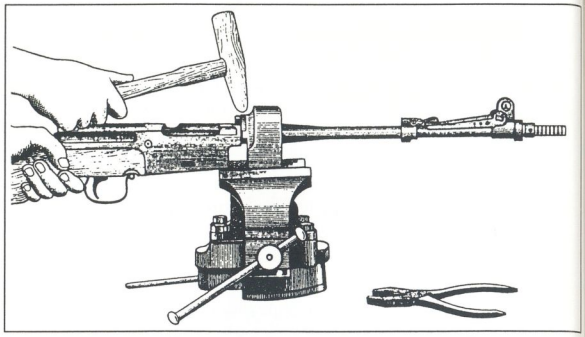
253. Three views of disassembly of components of the MAS rifle.
Above: removal of the front band assembly, MAS 49.
Above, right: removal of the lower band.
Below, right: removal of forestock and handguard.
document MAT 1148

The rear of the handguard is held by a retaining ring which surrounds the barrel. When this becomes deformed, it can be reshaped on a specially designed anvil (figs 254 and 255).

The lower band is made of sheet steel. The screw is threaded into a pressed extension or onto a soldered washer.

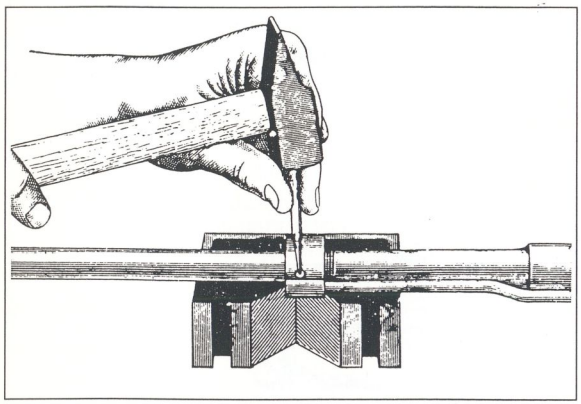
254. Right side view of the special mandrel, used to reshape bent or dented handguard retaining rings.



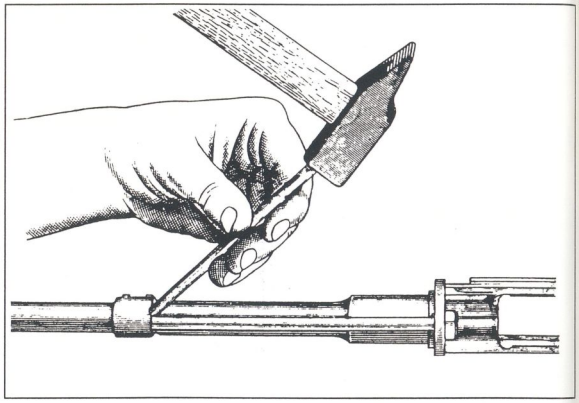


255. Reshaping the handguard retaining ring, using the special mandrel shown at left. document MAT 1148

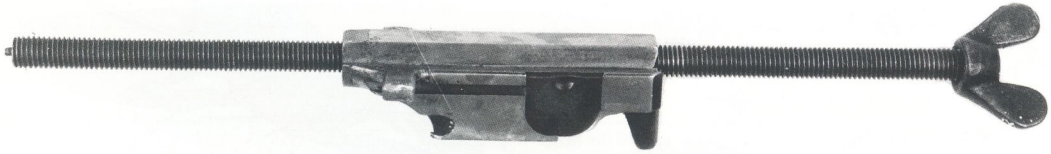
The Gas System



256. Removal of the gas tube retaining pin. document MAT 1148



257. Removal of the gas block. document MAT 1148



258. Centring and positioning tool, made from slave bolt carrier, used in replacement of gas block.

The gas tube, still much the same as the Rossignol original of 1901, is replaced using a hammer and the appropiate drifts as shown above.

Replacement of the gas block on the MAS 49 and MAS 49-56 requires special tools and gauges which differ for each model.

259. Gauge to verify correct internal depth of counterbore for gas tube in receiver.

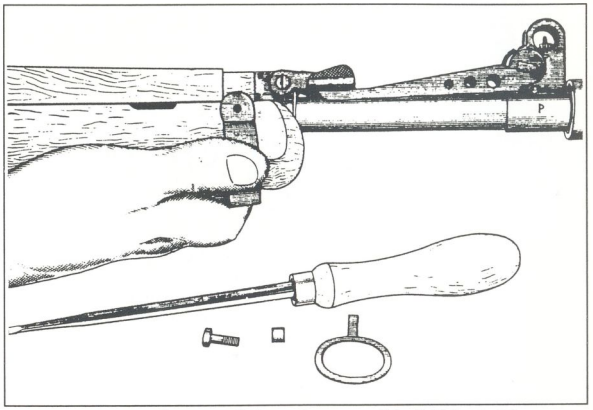
Grenade Launcher Device

As noted, there are two models of muzzle brakes. They can be disassembled with a special key after removal of the locking clip. Once reassembled, the locking clip is secured in the recess of the flash hider (fig 263).

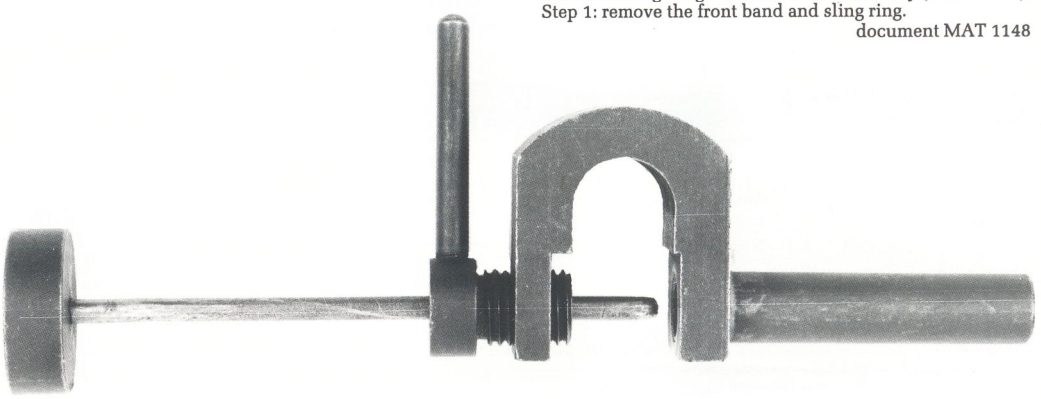
Replacement of the grenade retainer spring is facilitated by the use of a paper or aluminum cone, which are regulation tools (fig 264).

Grenade launcher depth, length and diameter gauges exist, as does a spigot gauge (nomenclature number 159 819 910 175) which controls the concentricity of the muzzle brake and ring. Additionally it verifies that the grenade descends onto the spigot the required 130 to 131mm.

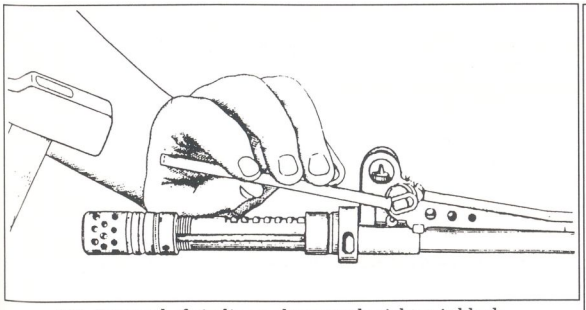
Replacement of the folding sight circlip and pin is done with hand tools (fig 265.). The replacement of the front sight support requires a drill.



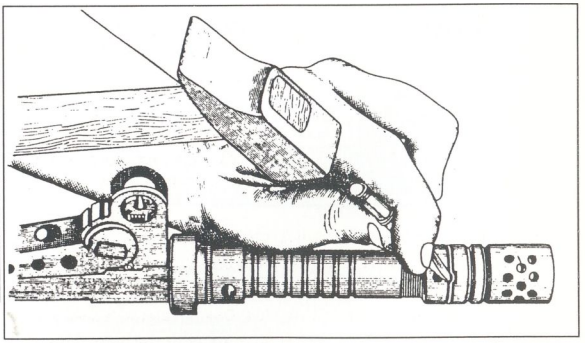
260. Removing the grenade launcher assembly (MAS 49-56). Step 1: remove the front band and sling ring.
document MAT 1148



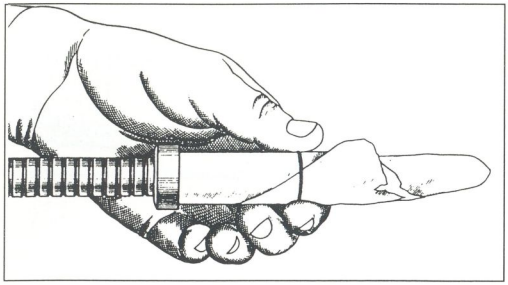
261. Press fixture for removal and replacement of grenade sight axis block.

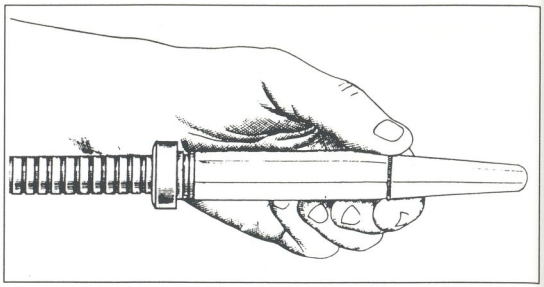


262. Removal of circlip on the grenade sight axis block.
document MAT 1148

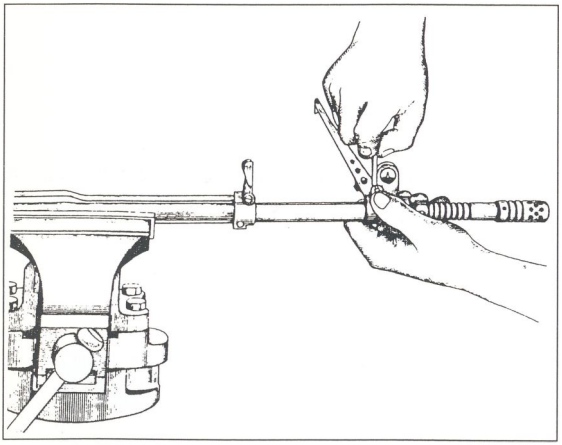


263. Securing flash hider by driving locking clip into recess.
document MAT 1148

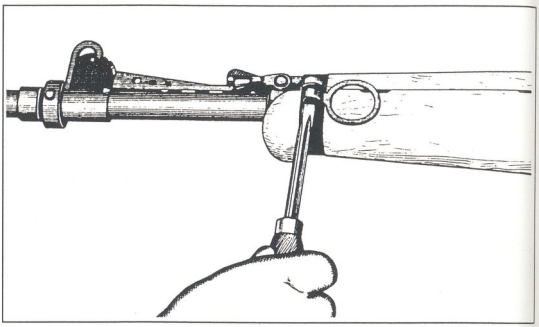




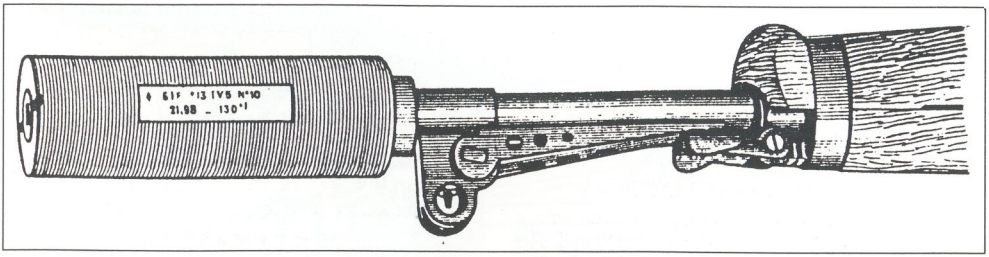
264.Two issued tools used to replace the grenade retaining spring.
Left: paper cone
Right: metal cone. document MAT 1148



265. Reassembling the grenade sight assembly.
document MAT 1148



266. Replacing the grenade launcher assembly (MAS 49-56): tightening the upper band. document MAT 1148



267. Ensuring the correct position (depth) of the assembled grenade launcher on the barrel, and verifying its concentricity with the bore of the rifle (MAS 49-56).
document MAT 1148

Converted (Launcherless) MAS 49 Rifles

After the Model 1948 grenade was abandoned, some MAS 49 rifles had their grenade launchers removed. This involved the following:

- removal of the folding grenade sight and the grenade spigot
- eventual use of a forend and a 2nd model handguard (without cutouts for the grenade sight)
- modification of front band by soldering a "lozenge" over the serrated worm screw housing
- elimination of the stacking rod (sometimes).

268. As noted, the MAS 49 did not have a gas cutoff valve, and the launching of heavier finned 22mm grenades proved extremely stressful to the action. The grenade launcher assembly (and sometimes the stacking rod) were removed from some rifles, as shown here on MAS 49 serial no F-3302.

Training Material

The .22LR Calibre MAS 50 Carbine

269. Right side view of the unsuccessful MAS 50 semi-automatic carbine, calibre .22 Long Rifle. Not adopted, and few sold commercially. Today this arm is a collector's item.
document Charlin

In 1950, *Manufacture Nationale d'Armes de St-Etienne* (MAS) developed a semi-automatic carbine in .22LR calibre, with two objectives:

- to interest the French Army in a training rifle, with which recruits could learn the basics of shooting at minimal cost;
- to secure a niche in the commercial market with a handy autoloading .22, against which at that time there was very little competition.

Description of the MAS 50

The one-piece stock is in varnished walnut, with a checquered pistol grip and short, rounded forend. The receiver is tubular, with the bolt handle and ejection port located on the right side.

The round barrel has been precision-rifled. The mechanism utilises an internal hammer which falls to impact the firing pin lodged in the bolt. The safety, located ahead of the triggerguard, pivots down to immobilise the firing mechanism and block entry to the triggerguard.

The ramp front sight is hooded, and a micrometer rear peep sight is graduated to 200 metres in 25m increments.

Characteristics, MAS 50 Carbine

calibre	.22 Long Rifle
overall length	1,050m (41")
barrel length	58cm (22.8")
weight	2.600kg (5¾ lbs)
magazine capacity	10 rounds

How the MAS 50 Fared

The similarities of purpose with the MAS 49—placement of the cocking handle; clip feeding; micro-adjustable peep rear sight; safety blocking the triggerguard—would seem to have guaranteed the MAS 50 carbine a kind reception from the French Army, but

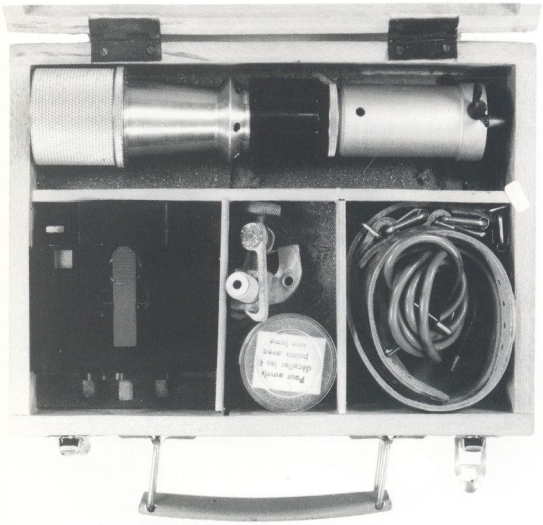
such was not the case: ironically, supplies of MAS 45 bolt-action .22LR rifles, developed late in World War II by Mauser Waffenfabrik and built there in some numbers after the war by the occupying French, were still on hand.

For some inexplicable reason, neither was the MAS 50 as successful as had been hoped on the commercial market: high production costs; lack of a well-established dealer network; the cold eye turned by the nation's civilian armsmakers onto what they quite rightly saw as a State-owned industry horning in on their territory—the real reason may never be discovered.

The result is that today the MAS 50 carbine is a seldom-encountered collector's item.

The Campana Day-Night Training System

270. A MAS 49-56 showing the Campana Day-Night Training System installed. When the trigger is pulled, a focussed beam of light is projected onto the target, producing a luminous dot at the point of theoretical impact which is visible in darkness or in daylight.



271. The Campana Day-Night Training System packed in its sectioned wooden transport and storage container.

Above: the lamp and projector assembly.

Below, from left: battery housing; trigger solenoid; connecting wires and their leather retaining straps.

An electrical device, which attaches to a service rifle and projects a concentrated dot of light onto a target when the rifle is "fired", was invented by a Monsieur Campana, then an officer on active duty with North-African troops, and produced by the André Losfeld Company of Paris. The Campana Day-Night Training System, as it was called, was adopted by the French Army in 1962.

The Campana System comprises a projector, containing a conical diffuser, at the base of which is a lamp. The "aim" of the lamp is adjustable by means of three wing-nuts, which clamp the projector assembly around the muzzle of the barrel.

Electricity is supplied by two 1.5v batteries, held in a housing which replaces the rifle's magazine. Flexible, insulated wires, bound to the rifle by simple leather straps, complete the circuit through a trigger-actuated solenoid. The latter is presented in a metal housing, positioned on the bottom of the rifle's triggerguard and secured by tightening a large knurled nut.

When the trigger is pulled, a silent, focussed beam of light is projected onto the target, producing a luminous dot, visible day or night, at the point of theoretical impact.

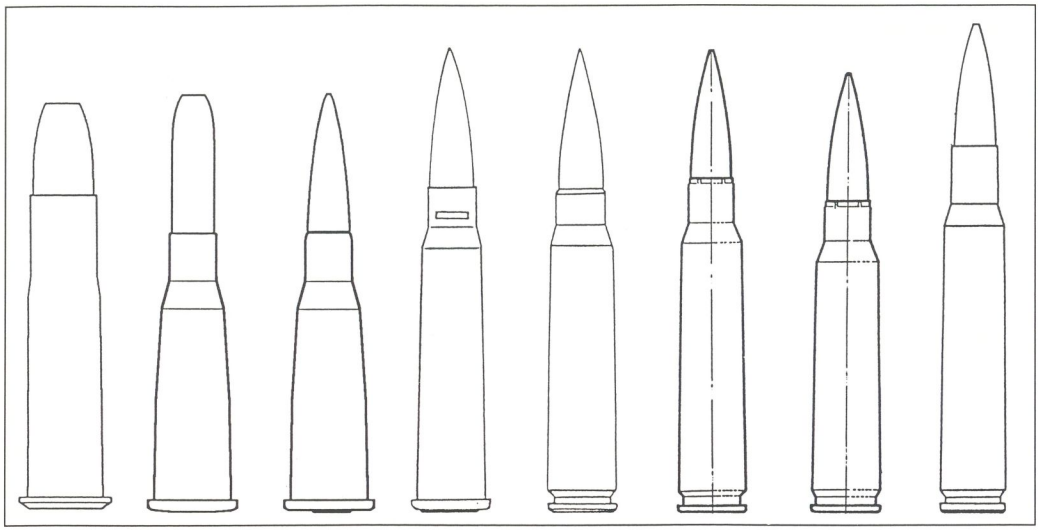
From the military point of view the Campana System presents several important advantages: it offers hands-on training with real rifles, day or night: while permitting instant, 100% critiquing of recruits' aiming

and firing techniques without a shot being fired; indeed without any live ammunition being present at all. The dangers ever present when familiarising the uninitiated with live weaponry are thus avoided completely, and of course the economy realised as regards ammunition expenditure is total.

The Campana Day-Night Training System has been adapted to the following French service arms:

- .22LR Instruction Carbine MAS 45
- 9mm Machine Pistol MAT 49
- 7.5mm bolt-action MAS 36 and 36-51 repeaters
- 7.5mm MAS 49 and 49-56 autoloaders
- 7.5mm light machinegun MM52

A training device with a somewhat similar idea was produced in support of the 9mm *Modèle* 1950 automatic pistol. Here, however, instead of converting an actual firearm, with all the attendant need for weapon security, the device was housed in a plastic model, built to the exact size and weight of the real Model 1950 pistol.



272. French Service rifle cartridges, 1866 - 1979. From left:

1. 11x59R Gras *Modèle* 1874. France's first metallic-cased Service cartridge. Used with explosive bullet loadings in French and US 11mm Vickers "balloon guns" during WWI.

2. 8x50R Lebel *Modèle* 1886 with flat-tipped *balle* M bullet. World's first military smokeless cartridge.

3. 8x50R Lebel M1886 D (a m). With solid-brass, bi-ogival *balle* D bullet and crimped primer; this was *the* French machinegun (and autoloader) loading of WWI, and in fact became standard issue for rifles and carbines, as well.

4. 7.7x56R (.303 British). Called by the French the "7.7", this round was manufactured in quantity for use in Lewis and Vickers aircraft machineguns during WWI, and later in the Darne. During the decade 1930 - 1940, Darne machineguns were used by the French Air Force and the French Navy in 7.5x54mm.

5. 7.92x57mm Mauser. Millions of rounds were captured or given to the French after WWI as part of their share of war booty, along with German Maxim MG08 and MG08/15 machineguns. These were used by the French during the interwar period for troop training, with occasionally disastrous results after the introduction of the following cartridge.

6. 7.5x58mm *Modèle* 1924. With a bullet like that of the Swiss and a cartridge case too closely dimensioned to that of the 7.92mm Mauser, accidents occurred when lookalike 7.92 ammunition was fired in 7.5mm Model 1924 Châtellerault machine rifles.

7. 7.5x54mm *Modèle* 1929. The official French Service cartridge for 50 years (until the adoption of the 5.56mm FAMAS in 1979).

8. 7.62x63mm (.30-'06). Manufactured in France as the 7.62mm *Modèle* 1949.

Chapter Ten

The French Service Cartridge

Introduction: *E Pluribus Unum*

During World War I, in spite of its excellent ballistic performance, it was clearly seen that the 8mm Lebel cartridge was fundamentally flawed, because of its ungainly profile. The French Army used the 8mm Lebel to best advantage in its (strip-fed) Hotchkiss machineguns, although there were other applications—the Chauchat; the M1917 rifle—while the Air Force used the .303, called the "7.7mm", in its British- and French-made Vickers guns.

Of course, the 7mm Meunier was also briefly used, as well as the 7.92mm Mauser in captured German machineguns; and the resurrected 11mm Gras M1874 cartridge with incendiary loadings for anti-balloon machineguns . .

In 1920 the Army High Command demanded a new rifle cartridge with a necked case and an almost cylindrical profile. The following year the first prototypes appeared, too late as noted for the first postwar prototype of the experimental autoloading MAS 1918-21 (Chapter Three), which fired the US .30-'06 cartridge.

The new French cartridge was a synthesis of the best military rounds in existence at that time: the Swiss 7.5mm Schmidt-Rubin, the American .30-'06 and the German 7.92mm Mauser. The 7.5x58mm cartridge was adopted in 1924, at the same time as the new fully-automatic machine rifle, finely tuned by *Manufacture d'Armes de Châtellerault* (MAC).

In Chapter Three we have already discussed how closely the French cartridge, the 7.5x58mm Model 1924, resembled the German 7.92x57mm round used in training with war booty machineguns, and that this caused accidents when the larger German bullet was shot from the smaller bore of the MAC 1924 machine rifle. A solution, proposed in 1926, was the use of a shorter case for which the 7.92mm German round would not, indeed could not, be mistaken. This idea was adopted in 1929, and the definitive round, still loaded with the bullet, *Modèle* 1924 C, became the Ball Cartridge 7.5x54mm *Modèle* 1929 C.

The 7.5x54mm cartridge was placed in production by private and State-owned ammunition factories, and it still serves the French Army, although the last production was in 1992 (with cases headstamped 1991).

Description of the 7.5x54mm M1929 C Cartridge

The Case

The case is slightly conical and shouldered. At its base, it has a cannelure and thus a rim, and the primer pocket. In the upper part, the neck receives the bullet.

The case is normally made of brass (model 1929), but phosphated steel was also used as an experiment before World War II and in limited quantities in 1945-46. In 1952 the bonderised and lacquered steel case was adopted. Such ammunition manufactured during the period 1954 - 1958 should not be used in certain rifles.

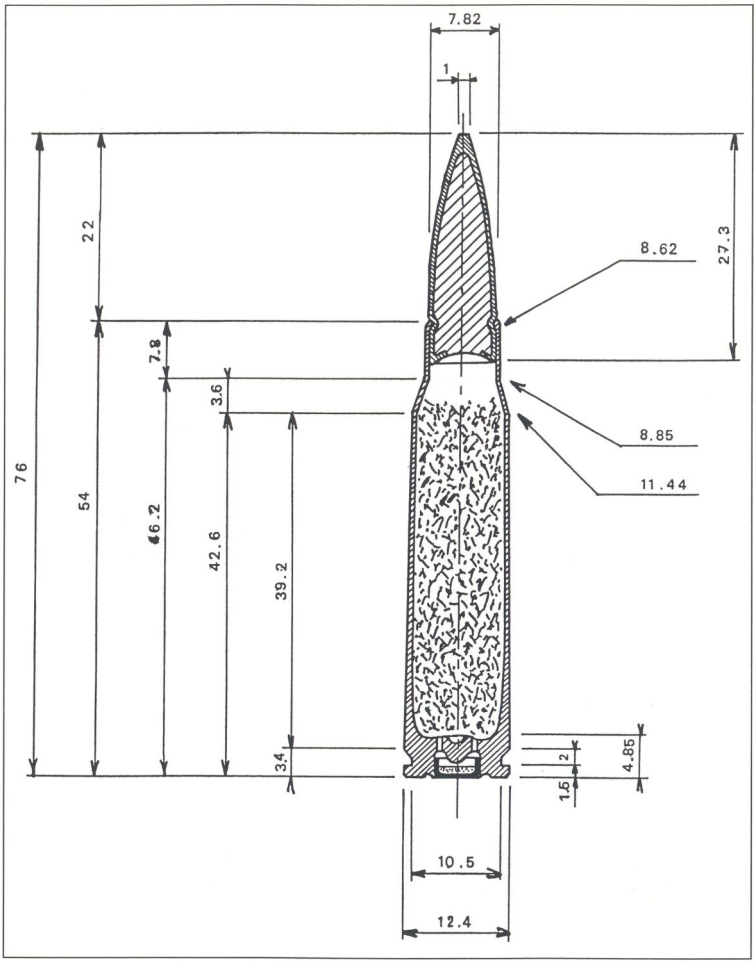
Coppered, chromed and cadmium-plated steel cases have been studied, as well as light alloy cases.

The Primer

French-made 7.5mm ammunition uses a Berdan-type primer, wherein the anvil is a protrusion in the primer pocket of the cartridge case. From the primer pocket two parallel or slightly converging flash holes lead into the case. The 1924 A primer has 3.6 centigrams of primer mixture, covered with a varnished disc. The Model 1951 primer is concave, with mixture content raised to 4.5 centigrams. Both were corrosive. The primer cup is crimped into the primer pocket (on the brass case only).

The Powder

The load is BPF1 powder or GB Se, which can vary from 2.8 to 3.2g (43.2 to 49.3 gr) depending on the lots.



273. The 7.5x54mm M1929 C French Service cartridge, sectioned and dimensioned in millimetres.

Total weight of loaded cartridge 23.5g (362.66 gr). Weight of case 11.60g (179 gr); weight of charge 2.90g (44.75 gr); weight of M1924 Ball bullet 9gr (139 gr).

twice-size drawing by the author

The Bullet

The Ball bullet Model 1924 C is pointed with a concave base. Its core is lead with 3% antimony, covered with a cupro-nickel-plated steel jacket. Since 1934 the jacket has had a cannelure which facilitates crimping.

After 1950 the bullet jacket was also manufactured in bonderised and waxed steel or in tombac (a copper-zinc alloy).

The Ball bullet Model 1924 C measures 27.3mm in length and weighs 9g (139 gr). Muzzle velocity is 820m/s 2,690 fps) which produces 300 kgm (2,170 ft/lbs)

of muzzle energy. At 400m it can perforate 3mm (⅛") of steel and penetrate 70 cm (27½") of light soil, or the same depth in dry pine. Its maximum range is 3,200 to 3,500m (3,500 to 3,828 yds).

In 1985, cartridges using the 7.62 NATO bullet (which diameter is identical to the 7.5mm) were tested.

Special-Use and Special-Purpose Variants

The cartridges described below are some of the most common 7.5mm loadings. As indicated, they cannot all be used in the rifles described in this book.

- Armour Piercing Cartridge Model 1929 P with Model 1935 armour-piercing bullet. Biogival with hard steel core and tombac jacket (manufactured until 1940). Weight 9.52g.
- Armour Piercing Cartridge with Model 1949 or 1949 A bullet. Black tip (confidential manufacture).
- Ball Cartridge 7.5mm Model 1929 C with bullet Model 1924 C (fig 274 no 1; described above).
- Ball Cartridge Model F 1 for the reduced barrel of the 106mm recoilless rifle. 7.62mm NATO bullet Model 61 withplated cupro-nickel steel jacket, tip painted yellow.
- Barracks Cartridge Model 1936 (fig 274 no 4). Short-ogive bullet with aluminum core, charged with nitred paper. For guard duty, and to maintain order.
- Blank Cartridge Model 1930 (fig 275 no 3). Wooden bullet, unpainted or painted blue. Use reserved for machine rifles.
- Blank Cartridge Model 1936. Wooden bullet painted red. Use reserved for machineguns.
- Blank Cartridge for fully-automatic rifles and machineguns (after 1958). Wooden bullet painted violet.
- Blank Cartridge Model 1937 (fig 275 no 4). Green paper bullet. Use reserved for rifles.
- Blank Cartridge Model 1958. Whole cartridge is white plastic with a metallic base. The bullet is pre- fragmented (*Bakelittfabriken* licence). Used with all weapons, including the MAS 49 and MAS 49-56.
- Blank Cartridge Model 1958 M. Similar to the preceding but this one is beveled at the bullet/case level.
- Blank Cartridge Model F1. Whole cartridge in white opaque or transparent plastic with a metallic head. The false bullet is more pointed than on the preceding variants.
- Blank cartridge with a wooden bullet gold-painted (for movie use).
- Blank cartridge in golden plastic (for movie use).
- Grenade Launching cartridge without bullet for use with VB (*Viven Bessière*) launcher. Brass case with six-branch star crimp, sealed with clear varnish (Reserved for the MAS 36).
- Grenade Launching Cartridge Model 1948 with white-painted wooden bullet, for grenade Model 1948.
- Grenade Launching Cartridge Model 1948 without bullet (fig 275 no 5). Case with star-crimp, sealed with red varnish, for grenade Model 1948.
- Grenade Launching cartridge without bullet for American grenades. Star-crimped case, throated at the neck, cardboard cap with black varnish.
- Grenade Launching cartridge without bullet for anti-tank and anti-personnel grenades Model 1950 (fig 276 no 1). Five-branch, star-crimped case, throated at the neck and sealed with red varnish.
- Grenade Launching cartridge without bullet for 22mm grenades, six-branch star crimp, throated at the neck, sealed with black varnish.
- Grenade Launching Cartridge without bullet Model F1 for French grenades, produced in several variations (fig 276 no 2). Star crimp, throated at the neck, with a cork wad sealed by a special gasket made of resin putty (bitumastic).
- Grenade Launching Cartridge without bullet Model F2 for French grenades, similar to the above but with a polyethylene cap replacing the cork wad.
- Grenade Launching cartridge without bullet for French grenades, similar to the above with with a fluted case.
- Grenade Launching cartridge without bullet for anti-personnel grenades, mounted on remote control launcher (used on armoured trains in-Algeria and nicknamed the "train trap"). Brass case, star crip, electric primer.
- Grenade Launching Cartridge Model 69B (fig 276 no 3) in white translucent plastic. This is identi-

274. Five loadings of the French 7.5mm cartridge. From left:
1. *Modèle* 1929 C with Ball Bullet Model 1924 C (discussed in the text).
2. Heavy-bullet Model 1929 D with 190 gr M1933 D bullet, used by all the fortess machineguns in the Maginot Line.
3. Tracer Model 1929 A with Tracer Bullet Model 1949 A.
4. Barracks Cartridge Model 1936, loaded with nitred paper for guard duty.
5. Reduced-Charge, Model 1929.

275. More variant loadings of the French 7.5mm cartridge. From left:
1. Reduced Charge Model F1.
2. Reduced Charge Tracer Model F2.
3. Blank, Model 1930. Unpainted or blue wooden bullet.
4. Blank, Model 1937. Green paper bullet.
5. Grenade Launching, Model 1948.

276. Still more variant loadings of the French 7.5mm cartridge. From left:
1. Grenade Launching, Model 1950.
2. Grenade Launching, Model F1 A (2nd type).
3. Grenade Launching, Model 69 B (2nd type).
4. Inert, one-piece phosphated steel with 8 vertical flutes on case.
5. Inert, nickeled, pierced case.

cal to the Model F1 blank cartridge, but because of its translucency it can be seen that the internal tube is closed in a star. Designed for launching tear gas grenades.

- Heavy Bullet Cartridge Model 1929 D with 12.35g (190 gr) heavy bullet Model 1933 D (fig 274 no 2). The bullet jacket is in cupro-nickel plated steel, chemically blackened (manufactured before 1940), or in lacquered or cupro-nickeled steel, or in tombac (copper-zinc alloy) with a violet tip (manufactured after 1945 and kept very confidential). The bullet is biogival, measuring 37mm in length. The use of this ammunition was reserved for fortress machineguns.
- Incendiary Cartridge Model 1935 I with Model 1935 I bullet. Cupro-nickel alloy jacket, blue tip and different primer and bullet crimps (manufactured until 1940). Weight 8.8g. Use reserved for aircraft machineguns.

The manufacturing schedule for 1950 included the production of a new incendiary bullet cartridge, but this project never took root.

- Inert Cartridge, one-piece in phosphated steel, with eight vertical flutes on the case (fig 276 no 4).
- Inert Cartridge, nickeled, pierced or unpierced case, no primer (fig 276 no 5).
- Inert Cartridge, with bullet painted white, no primer.
- Inert Cartridge, weighted, same aspect as a Ball cartridge but weighted with sand, steel shavings or a soft steel cylinder. Inert primer or none at all.
- Match cartridge with Model 61 bullet, plated cupro-nickel steel jacket, weighing 10.5g
- Match Cartridge with IS bullet, tombac jacket, weighing 11.8g
- Match Cartridge with KS bullet, plated cupro-nickel steel jacket, weighing 10.5g
- Reduced Charge Cartridge Model 1929 (fig 274 no 5) with lead ball bullet weighing about 3g. The charge is a nitred paper leaf. For use in the rifle.
- Reduced Charge Model 1961 Cartridge. Short pointed ogive bullet in orange-coloured plastic; brass case. For training with the rifle.
- Reduced Charge Model F1 Cartridge for rifle (fig 275 no 1). Short pointed ogive bullet in orange-colour plastic, case made of light alloy. Its previous name was "Model 1965 BALPLAST". It is reserved for training with the rifle (does not reload the semi-automatics).
- Reduced Charge Model 1952 for French 73mm and US 3.5" anti-tank rocket launchers. Lead ball bullet, brass case, electric primer. This cartridge has been renamed TIRED SPH.
- Reduced Charge Model F2 (fig 275 no 2) for 89mm anti-tank rocket launcher. Short bullet in orange plastic, brass case and electric primer.
- Reduced Charge Model F3 for 89mm anti-tank rocket launcher and for the Apilas. Pointed ogive bullet made of solid copper with tip painted red. Aluminum case with electric primer.
- Reduced Charge Model 1978 for 89mm anti-tank rocket launcher. Nickeled lead ball bullet, aluminum case with electric primer.
- Reduced Range Cartridge Model 1929. Pointed ogive bullet with aluminum core and cupro-nickel alloy jacket. Reserved for use in aircraft machineguns during flight.
- Reduced Range Cartridge Model 1954. Pointed ogive bullet with plated cupro-nickel, lacquered steel or tombac. Yellow tip, weight 9.05g (140 gr). Reserved for use in the reduced training barrel of the 75mm recoilless rifle.
- Tear Gas Grenade Launching cartridge, identical to the Grenade Launching Cartridge Model 69B above, but in green plastic (in service at CRS).
- Tear Gas Grenade Launching Cartridge without bullet Model G1, aluminum star crimped case, sealed with black varnish (in service with the *Gendarmerie*).
- Tracer Cartridge Model 1929 TO with Model 1935 tracer bullet. Tombac jacket with black tip, blackened bullet and primer crimps (manufactured until 1949). Weight 9.4g.
- Tracer Cartridge Model 1929 A with Model 1949 A tracer bullet (fig 274 no 3). Tombac jacket with red tip, soft steel core. Weight 9.4g.
- Tracer cartridge Model 1929 A with Model 1950 A tracer bullet. Plated cupro-nickel steel, tombac or laquered steel jacket. Green tip for the first production, then red. Lead core. Weight 9g.
- Tracer cartridge Model 1929 A with Model 58 A tracer bullet. The bullet is more dished, the jacket is made of tombac or plated cupro-nickel steel. It has a red tip. Weight 9.05g.
- Tracer cartridge Model F1 (previously Model G 59). Plated cupro-nickel or coppered steel jacket. Crimson tip, black bullet crimp. Weight 9.4g. Its use is reserved for the MAC 31 tank machinegun.
- Tracer cartridge with 7.62mm NATO tracer bullet. Tombac jacket with two cannelures. Red tip, weight 9g.

- Tracer Cartridge Model F 2 for the reduced barrel of the 106mm recoiless rifle. Uses 7.62mm NATO Tracer Bullet Model F 1 with plated cupro-nickel steel jacket with two canelures. The tip is painted yellow with a red band.
- Tracer, Armour Piercing Cartridge Model 1929 TP with Model 1935 tracer/armour-piercing bullet. Tombac jacket with green tip and green primer and bullet crimps (made until 1940). Weight 9.65g.
- Tracer, Armour Piercing Cartridge Model 1949 or 1949 A. Black tip and white band (until May 1958), black tip and red band after. Weight 9.4g. This cartridge is on the official list but the author has never seen even one example (nor has he seen the Armour Piercing or the Incendiary of the same model-year).

There are also numerous experimental variations, which are beyond the scope of this study.

Manufacture of the 7.5x54mm Cartridge in Other Countries

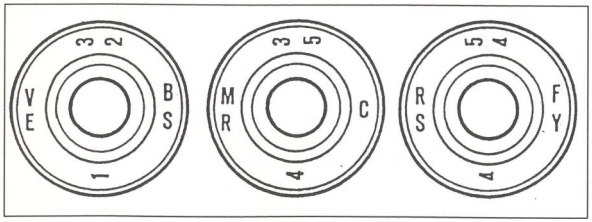
Aside from production by private and State-owned ammunition factories in France, the 7.5x54mm M1929 round has also been manufactured in the following countries:

- Belgium
- Cambodia
- Finland
- Upper Volta (loading only, with elements imported from France)
- Japan
- Morocco (?)
- Syria
- North Viet Nam
- South Viet Nam
- Yugoslavia

Headstamp Markings

Headstamps on French cartridges reveal a considerable amount of coded information, although it is not always easy to decipher. The bases of M1929 cartridges are marked in four cruciform sectors, the information in each sector differing depending on when the cartridge was manufactured, as follows:

From 1934 to 1959



277. Three typical French headstamps on 7.5mm M19219 cartridges manufactured between 1934 and 1959. From left:
1. made at Valence in the 1st quarter of 1932. Brass case (Bourges).
2. made by Manurhin in the 4th quarter of 1935. Brass case (Castelsarrazin).
3. made at Rennes in the 4th quarter of 1954. Brass case (Firminy).

- at 12 o'clock: the two last numbers of the year of manufacture of the case.
- at 3 o'clock: one, two or three letters identify the supplier of the metal used for the case.
- at 6 o'clock: the quarter of the year.
- at 9 o'clock: two letters (very rarely one or three) indicate the manufacturer.

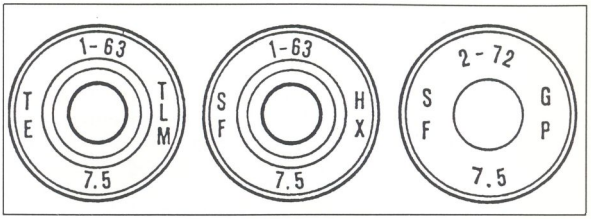
From 1959 to Present

- at 12 o'clock: the quarter and year of manufacture.
- at 3 o'clock: the case supplier's code.
- at 6 o'clock: the calibre.
- at 9 o'clock: the manufacturer's code.

There can be irregularities in this system:

- inversion of the placement of the initials of the manufacturer and the metal supplier;
- absence of one of the markings (usually the metal supplier's).

Certain cartridges in plastic or aluminum are not marked. In addition, there may be a lapse of time between the "manufacturing" date stamped on the base and the "loading" date stated on the packing.

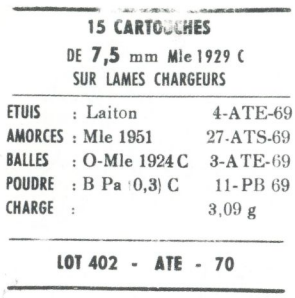


278. Three typical French headstamps on 7.5mm M19219 cartridges manufactured from 1959 to the present. From left:
1. made at Toulouse in the 1st quarter of 1963. Brass case (Marseille).
2. made by SFM (*Société Française de Munitions*) in the 1st quarter of 1963. Steel case (Pompey).
3. made by SFM in the 2nd quarter of 1972. Case in light alloy.

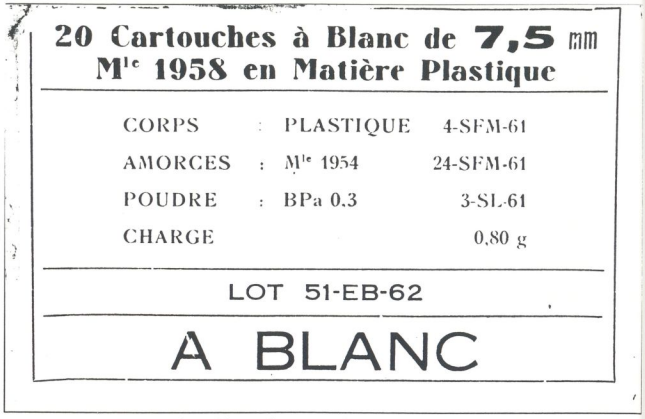
Cartridge and Case Manufacturer's Codes

These markings appear on the caseheads and/or on the packing:

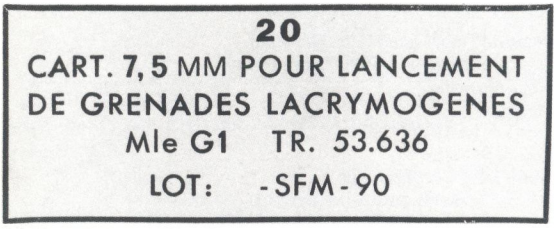
ATE . . . . . Atelier de Fabrication de Toulouse
ATS . . . . . Atelier de Fabrication de Tarbes (inert cartridges only)
CN . . . . . Atelier Méchanique de Normandie à Caen (loading only)
CP . . . . . Cartoucherie Paulet à Marseille
FML . . . . . Société FERE à Montreuil
LM . . . . . Atelier de Fabrication de Mans
LU . . . . . Luchaire à La Chapelle St Ursin
MI . . . . . Société Méridionale d'Industrie à Marseille
MR . . . . . Manufacture de Machines du Haut-Rhin (Manurhin)
NCS . . . . . Nouvelle Cartoucherie de Survilliers (plastic blank cartridges only)
RY . . . . . Etablissements Rey Frères à Nîmes
SF . . . . . Société Française des Munitions à Issy-les-Moulineaux
SFM . . . . . Société Française des Munitions à Issy-les-Moulineaux
SL . . . . . SEVRAN-LIVRY (powder manufactory only)
SV . . . . . Société Générale du Vide à Valence (loading only)
TE . . . . . Atelier de Fabrication de Toulouse
TH . . . . . Société des Tréfileries et Laminoirs du Havre à Rugles
TLH . . . . . Société des Tréfileries et Laminoirs du Havre à Rugles
TS . . . . . Atelier de Fabrication de Tarbes
VE . . . . . Atelier de Fabrication de Valence
VS . . . . . Atelier de Fabrication de Vincennes



279. Paperboard box of 15 cartridges, Ball, *Modèle* 1929 C on 5-round stripper clips. Loaded in 1970 by ATE.



280. Paperboard box of 20 cartridges, 7.5mm Blank Model 1958. As noted, these are made of white plastic with a metallic base, loaded with a pre-fragmented bakelite bullet. The Model 1958 Blank is used with all 7.5mm Service weapons.



281. Paperboard box of 20 Tear Gas Grenade Launching Cartridges Model G1. These are in service with the French *Gendarmerie*.

282. Paperboard box of 15 cartridges, Reduced Range Model 52 M. These electrically-primed, aluminum-cased reduced-load cartridges were designed to launch 73mm and US 3.5" rockets.

Metal Manufacturer's Codes

Brass Cases

A . . . . . Audemar et Guyon à Dôle (?)
B . . . . . Compagnie du Duralumin et du Cuivre à Boisthorel
BA . . . . . Fonderies et Laminoirs de Paris-Rouelles et Harfleur
BD . . . . . Forges Barriol Fils et Charles Dallières à Andrézieux
BDV . . . . . Les Fils de Victor Bidault et Cie à Vitry-sur-Seine
BS . . . . . Atelier de Laminage de l'Ecole Centrale de Pyrotechnie à Bourges
C . . . . . Compagnie Française des Métaux à Castelsarrazin

CC . . . . . Compagnie Française des Métaux à Castelsarrazin (before 1940)
CN . . . . . Etablissements Claudinon et Cie, Le Chambon-Feugerolles
CY . . . . . Crozet-Fourneyron, Le Chambon-Feugerolles
D . . . . . Compagnie du Duralumin et du Cuivre à Dives
DO . . . . . unknown
F . . . . . Tréfileries et Laminoirs de la Méditerrannée à Saint-Louis
H . . . . . Tréfileries et Laminoirs du Havre, Usine de Graville
I . . . . . Société de métallurgie Franco-Belge à Issy-les-Moulineaux
J . . . . . Jouband à Suresnes
LM . . . . . Atelier de Fabrication du Mans
M . . . . . Société Anonyme des Cuivres et Alliages de Ham
N . . . . . Société des Usines de Navarre à Evreux
NM . . . . . Diehl Metallwerke à Nuremberg (Germany)
P . . . . . Société Française des Métaux, Usine de Coueron
PC . . . . . Etablissements Caillaux à Boulogne-Billancourt
R . . . . . Société des Tréfileries et Laminoirs du Havre à Rugles
S . . . . . Compagnie Française des Métaux à Sérifontaines
SF . . . . . Compagnie Française des Munitions à Issy-les-Moulineaux
SI . . . . . Societa Metallurgica Italiane à Florence (Italy)
TLM . . . . . Tréfileries et Laminoirs de la Méditerranée à Marseille
V . . . . . Société des Tréfileries et Laminoirs de Biache à Saint-Waast
VA . . . . . Vereinigte Deutsche Metallwerk à Altena (Germany)
VD . . . . . Vereinigte Deutsche Nickelwerke à Schwerte (Germany)
Y . . . . . Société des Tréfileries et Laminoirs du Havre, Pont-de-Cheruy
▲ . . . . . unknown

Steel Cases

BO . . . . . Compagnie des Ateliers et Forges de la Loire, le Boucau
C . . . . . Compagnie Française des Métaux à Castelsarrazin
CC . . . . . Compagnie des Forges de Chatillon-Commentry et Neuves-Maisons (after 1945)
CCM . . . . . Compagnie des Forges de Chatillon-Commentry et Neuves-Maisons
DA . . . . . Usinor à Denain
EW . . . . . Eischweiller Bergwerks Verein à Eischweiller (Germany)
FY . . . . . Compagnie des Ateliers et Forges de la Loire à Firminy
KP . . . . . Krupp, Essen (Germany)
HX . . . . . Haut-Fourneaux et Aciéries de Pompey
ON . . . . . Compagnie des Ateliers et Forges de la Loire, Usine d'Ozion à L'Horme
PO . . . . . Forges de la Providence à Rehon
PY . . . . . Aciéries de Pompey, Usine de Dieulouard
SF . . . . . Société Française des Munitions à Issy-les-Moulineaux
VS . . . . . Secosar Röchling à Volklingen (Germany)
WB . . . . . Wurag Eisen und Stahwerke à Hohenlimburg (Germany)
WR . . . . . Stahlwerke Sudwesphalen à Geiswelb (Germany)
▲ . . . . . unknown

Light Alloy Cases

C . . . . . Compagnie Française des Métaux à Castelsarrazin
D . . . . . Compagnie du Duralumin et de Cuivre à Dives
F . . . . . Tréfileries et Laminoirs de la Méditerranée à Saint-Louis
GP . . . . . unknown
HMB . . . . . Tréfileries et Laminoirs du Havre à Montreuil-Belfroi

283. A Marine Commando *Grenadier* with his MAS 49-56, equipped for launching 34mm *Modèle* 1952 antipersonnel grenades.

An accurate, point-fire rifle with *built-in* area-fire capability greatly enhances unit effectiveness without the extra weight and bulk of a dedicated grenade launcher.

Chapter Eleven

Enhancing Area Fire Capability

A History of Rifle Grenade Use

During World War I the VB (*Viven-Bessière*) rifle grenade, introduced in 1917, became a tried and true weapon of the French *grenadiers*, used to great effect in conjunction with riflemen and *fusiliers mitrailleurs* (machine riflemen) in silencing German machinegun nests. The French VB grenade was adopted by the US Army for use by the AEF.

In the "first wave" autoloading rifle programme, use of the VB launcher for rifle grenades was specified right from the beginning.

Studies done during the 1930s to find a replacement system for the VB would have resulted in the anti-personnel grenade Model 1939, if production had started in time.

Then the Model 1941 anti-tank grenade placed into production the revolutionary idea of the hollow charge, perfected by the Mohaupt brothers and manufactured by Brandt. Resembling a small mortar shell, this grenade was launched by the special launcher accessory mounted on the MAS 36 (which could have been used on the MAS 40).

The performance of the Model 1941 grenade was quite impressive: it went right through a 40mm (1½") steel plate. Unfortunately, it arrived too late to be used in combat against the Germans in World War II.

After the war the Model 1948 anti-personnel rifle grenade (described below) was developed, intended for use with the MAS 36 (with 'G' marked on the barrel), MAS 36 LG (*lance-grenades*) 48, and MAS 49 rifles.

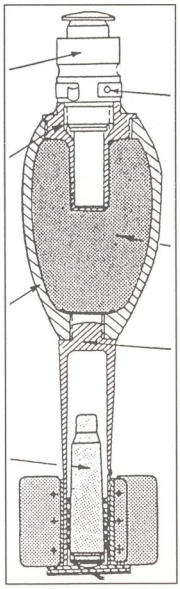
50mm Model 1948 Anti-Personnel Rifle Grenade

Created at the request of the French Expeditionary Force in Indochina, this was a modification of the 50mm grenade originally used with the Model 1937 launcher (fig 133) into a grenade capable of being launched from a rifle. The body is an egg-shaped steel casting with a 15mm inside diameter cylindrical tail, with six fins.

First used with the MAS 44 A (Chapter Six), the Model 1948 grenade was loaded with a cast explosive (Tolite, NX or Schneiderite). The explosion is triggered by an instantaneous impact fuse 19/23 Model 1937 M47, located in the tip. A safety pin is kept in place by an adhesive strip.

Identification of Types

- Tolite loaded grenades: black body and yellow ogive.
- NX or Schneiderite loadings: black body, yellow ogive and red collar.
- Type 1 inert instruction grenade: black body, white ogive.
- Type 2 inert instruction grenade: blue body and ogive.



284. Cutaway 1/2-scale view of the 50mm *Modèle* 1948 anti-personnel rifle grenade, showing components labelled as follows (clockwise from top):

fuse; safety pin and cord; explosive; fin assembly; bulletless launcher cartridge held in disposable rubber stopper.

Characteristics, *Modèle* 1948 Anti-Personnel Rifle Grenade

diameter . . . . . 50mm (20")	weight . . . . . 485g (1.06 lbs)
total length . . . . . 200mm (7.8")	range 260m
explosive charge . . . . . 70g (1,080 gr)	lethal radius 25m

France in the NATO Era

The integration of France into NATO triggered the development of rifle grenades dimensioned for rifles equipped with the NATO-standard 22mm launcher.

At that time French forces were equipped with a mix of 7.5mm MAS 36 M 51 or MAS 49-56 grenade-launching rifles in addition to 7.62mm (.30 calibre) US M1903s with M2 launchers and M1 Garands with M7 Modified launchers. Because of this, each grenade was delivered with <u>two</u> bulletless launching cartridges in a rubber sleeve: one in 7.5mm and one in 7.62mm (.30-'06). After the .30 calibre rifles were discarded, only the 7.5mm launching cartridge was furnished.

73mm Model 1950 Anti-Tank Rifle Grenade

This is an anti-tank grenade of high penetrating power. Its military loading is the same as the anti-tank rocket of the same calibre used with the Model 1950 rocket launcher. It can be used in direct fire up to 100m, but beyond 75m its accuracy diminishes.

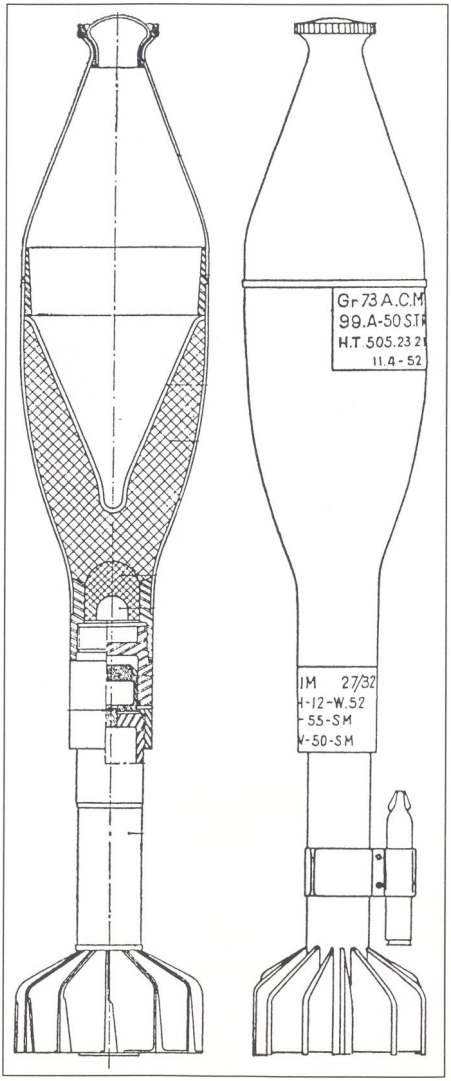
Its body is made of a light alloy (almasilium), with a cylindrical ogival form, with an internal copper forcing cone. A thin sheet steel ogive cap covers the body, and has an anti-ricochet nose.

It is loaded with a cast mixture of Hexogene and Tolite. The tail fuse is type 27/32 Model 1952. Grenades made after 1956 have a safety pin.

The tail is made up of a 22mm internal diameter tube with twelve fins in a light alloy (Alumag).

Identification of Types

- Loaded grenade: khaki
- Instruction grenade with detonator only: khaki with white ogive
- Inert instruction grenade: white

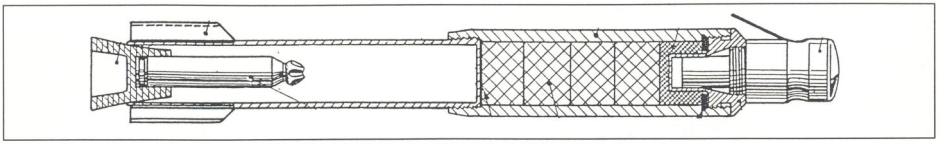


285. Two 1/2-scale views of the 73mm *Modèle* 1950 anti-tank rifle grenade.
Left: cutaway view, showing shaped charge.
Right: outside view, showing markings. Note star-crimped launcher cartridge, clipped to NATO-standard 22mm fin tube. document INF 126

Characteristics

diameter 73mm
total length 405mm
explosive charge 332g
weight 800g
range . . . . . 240m (262 yds)
lethal radius 15m
penetration . . . . . 280mm (11") armour

34mm Model 1952 Anti-Personnel Rifle Grenade



286. Half-scale side view of 34mm *Modèle* 1952 anti-personnel rifle grenade, cut away to show components.
Note the bulletless 7.5mm launcher cartridge, stored in the disposable rubber end plug. document INF 126

Its body is a steel cylinder enclosing an equal load of Hexogene and Tolite. A 19/23 Model 1939 M47 fuse is located in front of the body. Its design is the same as the Model 1948 anti-personnel grenade fuse, but the detonator is shorter. A safety pin located under the body is kept in place by an adhesive strip.

The tail is made up of a 22mm cylinder with eight Almasilium fins.

There is also a 34mm Model 1952 M 60 grenade with a pre-fragmented body.

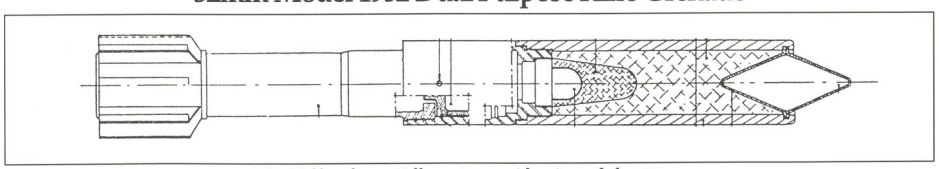
Identification of Types

- Loaded grenade: khaki
- Type 1 inert instruction grenade: black
- Type 2 inert instruction grenade: blue

Characteristics,

diameter 34mm
total length 268mm
explosive charge 42g
weight 500g
range . . . . . 100 to 410m
lethal radius 30m

32mm Model 1952 Dual Purpose Rifle Grenade



287. Half-scale partially cutaway side view of the 32mm *Modèle* 1952 dual-purpose rifle grenade. A further enhancement of the area fire capability of the MAS 49.
document INF 126

Intended both for anti-tank and anti-personnel use, this grenade has a steel cylindrical body with a conical head containing the explosive charge. The load is composed of equal parts of Hexogene and Tolite. It uses the 27/32 Model 1953 tail fuse, with a safety pin kept in place by an adhesive strip.

The tail is a 22mm internal diameter Zycral tube, with eight fins made of a light alloy (Almasilium).

Identification of Types

- Loaded grenade: khaki
- Type 1 inert instruction grenade: khaki with white conehead
- Type 2 inert instruction grenade: blue

Characteristics

diameter 32mm
total length 298mm
explosive charge 59mm
weight 520g
range . . . . . 100 to 400m
lethal radius 30m
penetration . . . . . 40mm (1.6") armour

32mm Model 1952 Anti-Personnel Rifle Grenade

Similar in design to the dual-purpose 32mm Model 1952 rifle grenade, but the AP grenade does not have a conical ogive and therefore does not have penetration power.

Identification of Types

- Loaded grenade: khaki
- Type 1 inert instruction grenade: khaki with white conehead
- Type 2 inert instruction grenade: blue

Characteristics

diameter 32mm
total length 298mm
weight 515g
range . . . . . 100 to 400m
lethal radius 30m

32mm Model 1954 Dual Purpose Rifle Grenade

This is a variant of the 32mm Model 1952 Dual Purpose rifle grenade. It differs only by the more tapered form of the copper forcing cone, obtained by lengthening its head and by increasing the diameter of its tail from 40 to 53mm.

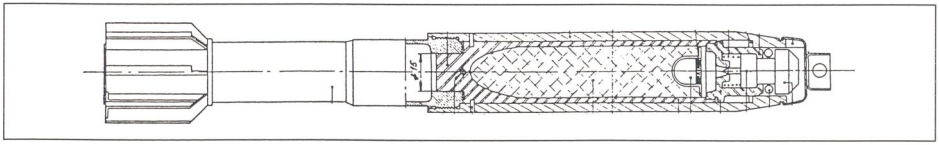
Identification

- Loaded grenade: khaki

Characteristics

diameter 32mm
total length 320mm
explosive charge 61g
weight 495g
range . . . . . 100 to 400m
lethal radius 30m
penetration . . . . . 80mm armour

32mm Model 1954 Anti-Personnel Rifle Grenade



288. Half-scale side view of the 32mm *Modèle* 1954 anti-personnel rifle grenade, shown partially cut away.
document INF 126

This design differs considerably from the other models described previously. Its steel body has an aluminum sleeve containing an explosive charge. The sleeve is held in place by two pins that break upon impact.

The load is formed by a compressed explosive (retarded Hexogene). It uses a special fuse 22.5/28.5 Type 32 Y A 54 A. The safety pin is located at the base. At impact, the fuse works either by energy or by compression.

The tail has eight fins made of Zycral.

Identification

- Loaded grenade: khaki

Characteristics

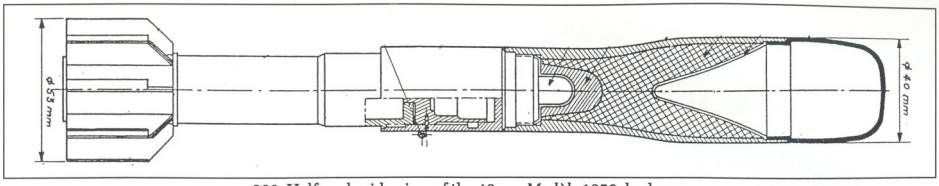
diameter 32mm
total length 287mm
explosive charge 42g
weight 507mm
range . . . . . 100 to 375m
lethal radius 30m

40mm Model 1956 Dual Purpose Rifle Grenade

This grenade is an evolution of the Models 1952 and 1954. It has a steel body, enlarged at the front, holding the explosive charge covered by a copper cone. A ballistic ogive made of Almasilium light alloy caps the grenade.

The load is a cast explosive of equal parts of Hexogene and Tolite. The rear fuse is type 27/32 Model 1956, which has a safety pin held by an adhesive strip.

The tail is the same as that of the Model 1954 grenade.



289. Half-scale side view of the 40mm *Modèle* 1956 dual-purpose rifle grenade, shown partially cut away.
document INF 126

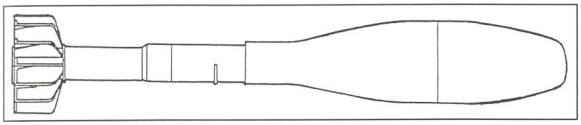
Identification of Types

- Loaded grenade: khaki
- Inert instruction grenade: blue

Characteristics

diameter 40mm
total length 305mm
explosive charge 80g
weight 510g
range . . . . . 100 to 400m
lethal radius 30m
penetration . . . . . 120mm armour

65mm Model 1961 Anti-Tank Rifle Grenade



290. Quarter-scale side outline view of the 65mm *Modèle* 1961 anti-tank rifle grenade. This grenade is 420mm (16.5") long, and will penetrate 300mm (almost 12") of armour.
document INF 126

Introduced to replace the 73mm Model 1950 anti-tank rifle grenade (note the more tapered nose). As with the other grenades, its load is Hexolite (mixture of Hexogene and Tolite). Its tail is made of plastic material.

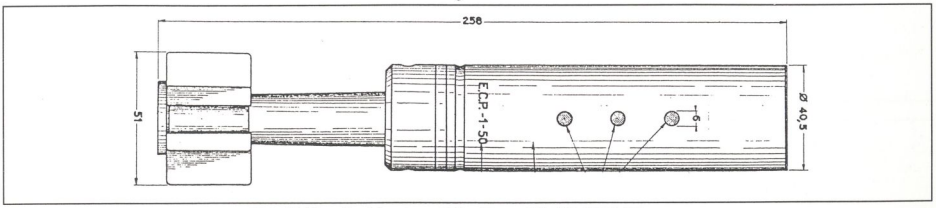
Identification of Types

- Loaded grenade: khaki
- Inert instruction grenade: white (has an anti-rebound flange)

Characteristics

diameter 65mm
total length 420mm
explosive charge 270g
weight 730g
range 100m
lethal radius 30m
penetration . . . . . 300mm armour

40mm Model 1848-50 Pyrotechnic Rifle Grenade



291. Half-scale side view of the 40mm *Modèle* 1848-50 pyrotechnic rifle grenade (coloured smoke version), dimensioned.
document INF 126

Destined to be launched by the MAS 36 or the MAS 49, this device has a cylindrical body made of a light alloy (Alumag) containing, depending on the markings:

- a silk parachute and an illuminating device in white, red or green
- three illuminating devices (white, red or green)
- three devices with coloured smoke (red, green or blue)

The grenade body also has a retarded ignition charge and a black powder charge as well as a quick fuse.

The cylindrical steel tail has six fins.

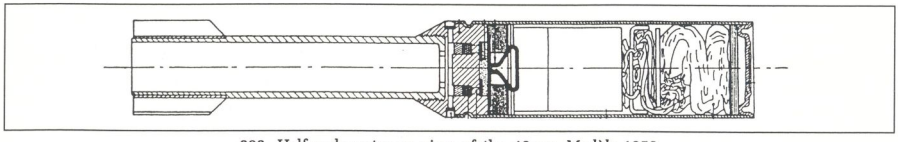
Identification of Types

- parachute illuminating grenade: one 12mm colour band (white, red or green)
- coloured illuminating grenade: three 6mm colour bands (white, red, or green)
- coloured smoke grenade: three 6mm colour discs red, green or blue)

Characteristics

diameter 40mm
total length 235mm
weight . . . . . 340 to 425g

40mm Model 1952 Illuminating Rifle Grenade



292. Half-scale cutaway view of the 40mm *Modèle* 1952 illuminating rifle grenade. Note the folded silk parachute.
document INF 126

This design is very close to that of the Model 48-50. It was destined to be launched from rifles having the NATO-standard 22mm diameter launcher. It has a light alloy (Alumag) cylindrical body containing:

- a silk parachute
- an illuminating device composed of magnesium and barium nitrate,
- a quick fuse
- a retarder, with the first-fire composition and the igniter.

The cylindrical tail is made of a light alloy (Zicral), and has eight Almasilium alloy fins.

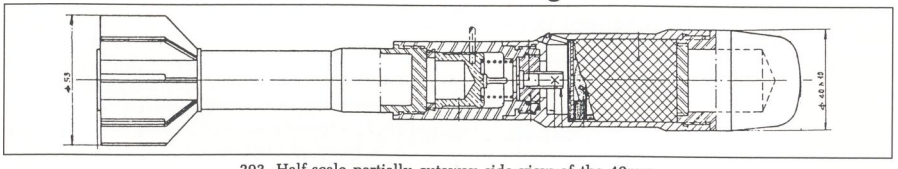
Identification

- a white 12mm band

Characteristics

diameter 40mm
total length 270mm
weight 285g

40mm Model 1956 Smoke Training Rifle Grenade



293. Half-scale partially cutaway side view of the 40mm *Modèle* 1956 smoke training rifle grenade.
document INF 126

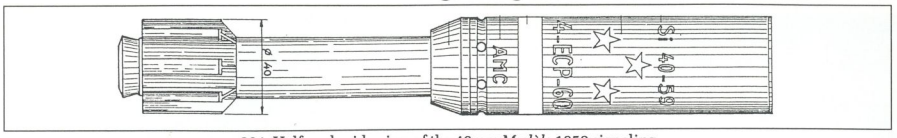
This grenade is derived from the AP/AV Model 1956. It is used in indirect fire for instruction purposes. Upon impact it gives off a small cloud of red or green smoke which allows the adjustment of the next shot.

The grenade has a steel cylindrical body, capped by an ogive manufactured of Alpax, which holds the smoke charge. It uses the rear fuse 27/32 P 38-F Model 1957, with a safety pin. The grenade can be recharged and is painted blue.

Characteristics

diameter 40mm
total length 288mm
weight 505g
range . . . . . 100 to 400m

40mm Model 1959 Signaling Rifle Grenade



294. Half-scale side view of the 40mm *Modèle* 1959 signaling rifle grenade, showing markings. document INF 126

The design of this grenade follows the same idea as the Model 1952 illuminating rifle grenade. There are several types:

- with parachute, with one white, red or green star
- with parachute, with red, green or yellow smoke
- without parachute, with three white, red or green signal flares
- without parachute, with red, green or yellow smoke

Identification of Types

- Signal grenade: khaki with a parachuting star or three stars with a colour band
- Smoke grenade: khaki with a parachuting square or three squares with a colour band

In addition, there are relief marks on the lid.

47mm Model F3 Smoke Rifle Grenade

This is a development of the Model 1956 training grenade, having a more substantial charge of Hexaclorethane.

Characteristics

diameter	47mm
total length	324mm
explosive charge	170g
weight	517g
range	100 to 400m

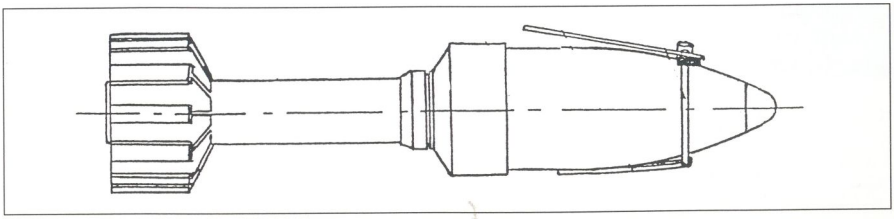
50mm Model 1954 (or F1) Smoke Rifle Grenade

This grenade is fired singly or in series to provide a smoke screen when a tank or other objective is near so that the enemy is blinded.

The cylindrical tapered body has an aluminum head which crushes upon impact. To the rear it has a large plug, onto which the tail is screwed. The inertia fuse in the head has a safety pin. The twelve-finned tail is made of plastic.

Characteristics

diameter	54mm
total length	270mm
explosive charge	178g
weight	580g
range	90 to 350m

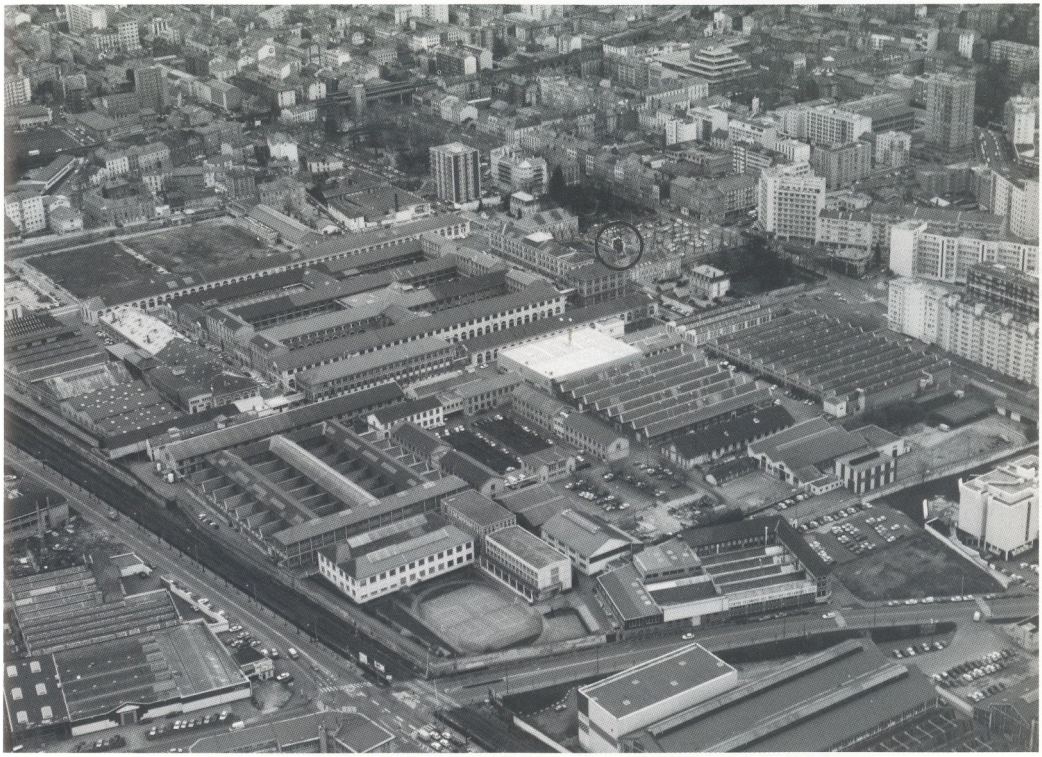


295. Half-scale side view of the 50mm *Modèle* 1954 (F1) smoke rifle grenade. document MAT 2424

296. Closeup of the ceremonial Gates of Honour of the *Manufacture Nationale de St-Etienne* (MAS), erected in 1866, as they stand today.
Compare with fig 2. photo courtesy MAS

Chapter Twelve

French Small Arms Today



297. An aerial view of *Manufacture Nationale de St-Etienne* today. The privatised MAS factory is now part of the giant GIAT Industies group.

In addition to small arms, MAS manufactured rocket-launchers, tank turrets and chemical, bacteriological and nuclear protection material.

Note the ceremonial Gates of Honour (encircled).

photo courtesy MAS

Two Mysterious Prototypes

The 7.65x35mm Short Carbine

298. Two views of the 'mystery' 7.65x35mm autoloading carbine discovered by the author during the course of researching this book.

Above: right side view. Note the sidelatching magazine.

Below: left side view. The transverse locking shoulder is clearly visible in the machined receiver, above the US M1 rifle-type safety in the front of the triggerguard bow.

After the Liberation, French arms production started up again with weapons and prototypes from before the war. Dozens of automatic weapon prototypes were made.

During the course of researching this book the author discovered two unidentified semi-automatic arms, probably manufactured at the MAS plant between 1945 and 1950.

The first is a carbine chambered for the Model 1948 7.65x35mm short cartridge, described as follows:

- two-piece stock
- pistol grip buttstock
- short forend, with free-floating barrel
- use of gas impingement system with gas piston
- machined-steel receiver with detachable bolt support
- tilting, rear-locking bolt as used on the MAS 44
- cocking handle on the right (mounted on the front end of the gas piston)
- rear peep sight, graduated from 100 to 600m, mounted on an ascending support guided by a rotating drum
- magazine retained by a side latch, as on later MAS rifles

Characteristics, (MAS) 7.65x35mm Carbine

overall length . . . . . .869m (34.2")
barrel length . . . . . .400m (15.75")
weight . . . . . 3kg (6.6 lbs)
magazine capacity . . . . 15 rounds

The 7.5x54mm Autoloading Rifle with Stamped Receiver

The second 'mystery' arm is a semi-automatic rifle, using the same gas and locking systems as the carbine described above. However the receiver is made of sheet steel stampings, coarsely welded. Judging from its rough and unrefined exterior, this was probably a model made up to test the feasibility of this method of construction.

It is chambered for the Model 1929 7.5x54mm cartridge, and uses the side-latch magazine common to MAS semi-automatic rifles made after the war.

During the early postwar period the French utilised stamping plants in captured German arms factories, notably Mauser in Oberndorf, to develop a pro-

299. Two views of the 'mystery' 7.5mm autoloading rifle discovered by the author during the course of researching this book.

Above: right side view. Note the side-latching MAS 49-type magazine, and the cocking handle slot, in the gas piston above the handguard. The handle itself is missing.

Disassembly of this arm is begun by unscrewing the rear transverse pin, behind the triggerguard.

Below: left side view. Note the reinforced oblong block on the receiver ahead of the trigger, which contains the locking shoulder.

totype MAS 36 bolt action rifle with a stamped receiver, and that project could well have branched out into the prototype autoloader depicted here.

The peep-sight is mounted on a cursor which slides on a ramp.

Characteristics, (MAS) 7.5x54mm Autoloading Rifle

overall length	1.080m (42.5")
barrel length	.580m (22.8")
weight	4.580kg (10 lbs)
magazine capacity	10 rounds

How the Big Three Have Fared

Manufacture Nationale d'Armes de St-Etienne (MAS)

By 1987, MAS had 2,050 workers and its facilities spread over 23 hectares (56.8 acres) of land.

In 1990, the State arsenals were privatised and united under the giant GIAT Industries Group, together with other subsidiaries such as Manurhin, Luchaire and FN-Herstal.

The reduction of military budgets has had repercussions on sales, which forced MAS to reduce its personnel to 600 people in 1995, while some of its activities were transferred to other factories in the group.

In 1995, *Manufacture Nationale de St-Etienne* was manufacturing the following small arms:

- FAMAS G2 5.56mm automatic rifle
- G1 9mm pistol (Beretta licence)
- FR F 2 and FRG 7.62mm Sniper rifles.

Manufacture Nationale d'Armes de Châtellerault (MAC)

At the beginning of the occupation the Châtellerault arms factory was converted to the production of civilian items such as parts for gasogene vehicles. Then, in 1942, the Germans ordered MAC to begin production of accessories for German arms (notably bayonets for the K98k rifle) as well as MAC 31 machineguns for the Atlantic Wall.

With the Liberation repairs were begun to some of the buildings of the establishment, which had been damaged by the Germans before their retreat. Early manufacture consisted of components for small arms and vehicle repairs.

Production of machine rifles and MAC 31 machineguns was resumed, along with hunting rifles, MAT 49 machine pistols, M1935S M1 and MAC1950

automatic pistols, cartridge-loading machinery, and woodworking machine-tools. In addition, a GMC truck repair centre was established, and production begun of components for armoured fighting vehicles.

MAC participated in the development of numerous other infantry and aviation arms, notably the AA 52 machinegun, adopted in 1952 and since manufactured in a great number of models. Other products include flame-throwers, tank mortars, and ENTAC guided missiles.

The *Direction des Etudes et Fabrications* (DEFA, discussed below) started planning to close one of the three State arsenals in the fifties. After hesitating between Châtellerault and Tulle, the decision was taken to retain the latter. The Châtellerault plant was progressively wound down between 1964 and 1969, its functions being transferred to St-Etienne and Tulle. Tooling was sold off or disposed of, and the personnel were reclassified or licenced as private gunsmiths. As for the ancient and historic buildings themselves, today they house a car museum, a technical school, and the *Centre d'Archives de l'Armement* (CAA).

Manufacture Nationale d'Armes de Tulle (MAT)

In 1944 Tulle was forced to pay a high tribute for Resistance activities against the Germans in the region: the SS *Das Reich* Division executed 99 hostages, of whom 54 were employees of MAT. The factory was then dismantled and the machines sent by train to Epernay, where the Allies had arrived before anything was up and running.

The factory recovered as well as it could, and little by little resumed activity. The first postwar product was a run of buttstocks for the French copy of the Sten. A machine pistol called the *Gnome et Rhône* was built, then parts manufacture was resumed for the FM 24-29 machine rifle and 20mm cannon, and sporting arms were again produced.

The 9mm MAT 49 machine pistol was developed at Tulle, of which 700,000 were made.

Starting in 1967, some of MAT's small arms production capability was gradually transferred to MAS, although MAT took over production of the AA 52 and 7.62mm N-F1 machineguns when MAC was closed.

Latterly MAT has been progressively oriented toward the manufacture of medium-calibre automatic arms: 20mm M621 and M693 cannon, 25mm M811 and 30mm M553 and M554 aviation cannon. The M791B 30mm combat cannon for the "Rafale" fighter and the light M781 30mm cannon for combat helicopters were developed at MAT. MAT also produces machineguns and certain components of the 5.56mm FAMAS.

Other Modern French Defence Establishments

Puteaux Arsenal (APX)

Founded in 1866 and home of the famous "French 75" artillery piece, APX made a number of items for the French military, from optics to missiles.

The actual Puteaux Arsenal closed its doors some twenty years ago, its artillery function being transferred to Bourges, and its optics work to the *Atelier des Moulineaux* (AMX), which is best known as a tank factory. The two establishments were reorganised into a single complex under the banner AMX-APX, located at Satory, near Versailles. Today AMX-APX is also a part of the giant GIAT Industries defence conglomerate, discussed below.

Technical Establishment of Versailles (CTV)

After World War I, the *Commission Technique de Versailles* had become the *Commission d'Expérience de Versailles* (CEV), then the *Etablissement Technique de Versailles* (ETVS). After WWII the *Laboratoire de Balistique Intérieure* (Interior Ballistics Laboratory), established within the Versailles complex in 1934, became the *Laboratoire de Recherche et Balistique Appliquée* (LRBA).

After WWII, in addition to theirprime function as a trials centre, ETVS developed experimental ammunition. These activities have since been split up and reattached, one as a part of STAT, the other as a part of ETBS.

DEFA; DTAT, then DAT

DEFA (*La Direction des Etudes et Fabrication d'Armement*) was established in 1946 by its parent body the *Direction Générale à l'Armement* (DGA) to take over the direction of all *Manufactures Nationales* and other military manufactories supplying French land forces.

Renamed DTAT (*Direction Technique des Armements Terrestres*) and then DAT (*Direction des Armements Terrestres*, Directorate of Land Armament).

The function of DAT is to coordinate all study and development of land armament, as requested by the General Staff.

L'Etablissement de Fabrication de Bourges (EFAB)

Created by order of Emperor Napoleon III on June 30, 1860 as a cannon foundry, to replace those at Strasbourg, Douai and Toulouse.

In 1881 a gun carriage factory was added, which amalgamated with the foundry in 1903 to become the *Fonderie de Bourges*. Dedicated to the production of medium and large-calibre cannon, the name was changed in 1912 to *Atelier de Construction de Bourges* (ABS).

In 1967 it merged with the cartridge manufactory *L'Ecole Centrale de Pyrotechnie*, also located at Bourges, to become *l'Etablissement de Fabrication de Bourges* (EFAB). That same year EFAB received the leftovers after the closure of the State arsenal at Mulhouse.

In the years preceding privatisation and the formation of GIAT, EFAB was a design and development centre for prototype small arms. Today it is also part of the GIAT Industries group.

L'Etablissement Technique de Bourges (ETBS)

The ETBS was the descendant of the *Commission d'Experiences de Bourges* (Bourges Trials Commission), founded in1871 as a test centre for heavy weapons.

Placed under the *Direction des Fabrication d'Armement* in1933, EFAB conducted tank, armour and aerial bomb trials under the new acronym ETBS, which it retains to this day.

After the Liberation, when overall control of the entire defence establishment passed to DEFA, ETBS continued with trials of heavy matériel. The Portable Arms Department of ETV (Versailles) was transferred to ETBS in 1959.

ETBS is a military establishment, taking its orders from the *Délégation Générale à l'Armement* (DGA). In 1972, ETBS was awarded the role of Army Technical Centre for Arms and Munitions, for which it was furnished with ultra-modern equipment and relocated to a new site adjoining that of EFAB.

Section Technique de l'Armée de Terre (STAT)

Reorganised in 1946, first as *Section Technique de l'Armée* (STA), then *Section Technique de l'Armée de Terre* (STAT).

STAT moved from its historic location close to Paris in 1974, settling into the Gribeauval quarter of Satory, near Versailles where its role consists of establishing specifications for military matériel, and effecting the initial tests and experiments necessary before an item is released for troop trials.

GIAT: the Emerging Giant

As noted, reorganisation of the State arsenals made MAS one of the original ten establishments in the government-owned GIAT Group (*Groupement Industriel des Armements Terrestres*; Industrial Group of Land Armament).

Since privatisation, GIAT has become a "National Society" in France, and is funded by public capital.

GIAT now controls 24 industrial sites and armament factories in Europe and the US, including Creusot-Loire, Manurhin, Luchaire, SFM, FN Herstal, and Winchester, plus PRB SA, Cimé Bocuze SA, and Canons Delcour. Activities are principally oriented to military armament, with diversification into the civilian industrial sector.

The GIAT group is articulated into several main sectors of activity, as follows:

- *Euro Mobilité*: armoured vehicles and turrets

- *Euro Vecteurs*: artillery and small arms
- *Euro Impact*: munitions, warheads, antitank systems
- *Gilog*: integral logistics support
- *Gitech*: industrial equipment
- *Chasse et Tir* (Hunting and Sporting): arms and ammunition

Evolution of the French Rifle: 1717 to the Present

Model 1717 flintlock rifle
Model 1754 flintlock rifle
Model 1763 flintlock rifle
Model 1766 flintlock rifle
Model 1777 flintlock rifle
Model Year IX flintlock rifle
Model Year XIII flintlock rifle
Model 1816 flintlock rifle
Model 1822 flintlock rifle
Model 1825 flintlock rifle
Model 1840 percussion rifle
Model 1822 T and 1822 T bis (flintlocks converted to percussion)
Model 1842 percussion rifle
Model 1825 T (flintlock converted to percussion)
Model 1853 percussion rifle
Model 1854 percussion rifle
Model 1857 percussion rifle
Model 1859 percussion rifle
Model 1866 needle gun (Chassepot system)
Model 1867 converted from muzzle to breech loader ("Tabatière" system; a copy of the Snider patent)
Model 1874 single-shot rifle (Gras system)
Model 1878 repeating rifle (Kropatschek system)
Model 1884 repeating rifle
Model 1885 repeating rifle
Model 1886 repeating rifle (Lebel system)
Model 1890 repeating carbine (Mannlicher-Berthier system)
Model 1892 repeating carbine (Mannlicher-Berthier system)
Model 1902 repeating rifle (Mannlicher-Berthier system)
Model 1907 repeating rifle (Mannlicher-Berthier system)
Model 1907-15 repeating rifle (Mannlicher-Berthier system)
Model 1892-16 repeating carbine (Mannlicher-Berthier system)
Model 1916 repeating carbine (Mannlicher-Berthier system)
Model 1916 repeating rifle (Mannlicher-Berthier system)
Model 1917 (RSC) semi-automatic rifle
Model 07-15 M 34 repeating rifle (Mannlicher-Berthier system)
Model 1886 R 35 repeating musket (Lebel system)
MAS 36 repeating rifle
MAS 36 CR 39 (*crosse rabattable*; folding stock) repeating rifle
MAS 36 LG 48 (*lance grenades*; grenade launching) repeating rifle
MAS 36 M 51 repeating rifle
MAS 44 autoloading rifle
MAS 49 semi-automatic rifle
MAS 49-56 semi-automatic rifle
MAS 49-56 MSE (Modifed St-Etienne) semi-automatic rifle
FAMAS F 1 and G 2 assault rifles
FR F1, FR F2 and FRG Sniper rifles

Bibliography

- *L'Arme en France* Paul Ronin. Dumas, St-Etienne, 1957
- *Armes à Feu de l'Armée Française 1860-1940 Jean Martin. Crépin-Leblond, Paris, 1974*
- *Armes à Feu Françaises Modèles Réglementaires 1858-1918* J Boudriot, P Lorain et R Marquiset. Paris, 1969
- *Armes à Feu Françaises Modèles Réglementaires—Armement d'essai 1759-1917* J Boudriot, P Lorain et R Marquiset. Paris, 1971
- *Les Armes a Feu Portatives des Armées Actuelles et Leurs Munitions* Librairie militaire L Baudoin, Paris, 1894.
- *Les Armes a Feu Portatives des Armées Actuelles et Leurs Munitions* Commandant Bornecque. Librairie militaire R Chapelot, Paris, 1905.
- *The Arms of Krupp 1587 - 1968* William Manchester. Little, Brown & Co, Boston & Toronto, 1964
- *L'Avènement des Armes Automatiques* Marcel Devouges. Lavauzelle, Paris 1925.
- *L'Aventure du Fusil Meunier* Philippe Regenstreif. Revue AMI No 80, 1986
- *Les Cartouches Françaises de 7,5mm* Jean Huon. Multi-Arms, Rambouillet, 1985
- *Les Cartouches pour Fusils et Mitrailleuses* Jean Huon. Amphora, Paris, 1986
- *Catalogue des Armes Legères et Affûts en Service dans l'Armée* MAT 1180, 1958
- *Catalogue des Armes Legères et Affûts en Service dans l'Armée* MAT 1191, 1982
- *Catalogue des Ensembles Partiels et Pièces Detachées du Fusil Semi-Automatique MAS 1949-56* MAT 1406 - 1966.
- *Catalogue Illustré du Fusil Semi-Automatique de 7,5mm Modéle 1949-56 et 1949-56 M-SE* MAT 1199, 1974.
- *Cours Munitions "Les Artifices"* ESAM, 1978
- *Cours Munitions "Manuel des Munitions"* ESAM, 1977
- *Deux FSA Français de la "Belle Epoque" 1894-1910* Pierre Lorain. *Gazette des Armes* No 80, 1980
- *The Devil's Paintbrush—Sir Hiram Maxim's Gun* Dolf L Goldsmith. Collector Grade Publications Inc, Cobourg, Ontario, 1989; 1993
- *Essai d'un fusil automatique Revelli* CAA , 1913.
- *Etat Actuel de la Question des Mitrailleuses, des Fusils-Mitrailleuuses et des Fusils Automatiques* Capitaine Noël. *Revue de l'Armée Belge*, Liège, 1910
- *The Franco-Prussian War; the Invasion of France 1870 - 1871* Professor Michael Howard. London, 1962
- *Le Fusil Automatique MAS Modèle 1940* Stéphane Ferrard. Gazette des Armes No 60, 1978
- *Les Fusils Automatiques Modèles 1917 et 1918* Pierre Lorain. Gazette des Armes No 122, 1983
- *Les Fusils Français et Etrangers* Capitaine Pichené. Lavauzelle, Paris 1955
- *Le Fusil Hagen* Jean Huon. *Cibles* No 134, 1981
- *Le Fusil Semi-Automatique Cei-Rigotti* Jean Huon *L'Amateur d'Armes* No 113, 1991
- *Fusil Semi-Automatique de 7,5mm Modèle 1949* MAT 1031, 1970
- *Fusil Semi-Automatique de 7,5mm Modèle 1949/56* MAT 1067, 1958
- *Le Fusil Semi-Automatique Modèle 1917* Jean Huon. *Cibles* No 183, 1985
- *Le Fusil Semi-Automatique Modèle 1949-56* Stéphane Ferrard. *Gazette des Armes* No 114 et 116, 1983

- *Les Fusils Semi-Automatiques Français de 7,5mm Modèles 1949 et 1949-56* Jean Huon. *Cibles* No 41 and 42, 1973
- *The Grand Old Lady of No Man's Land—The Vickers Machinegun* Dolf L Goldsmith. Collector Grade Publications Inc, Cobourg, Ontario, 1994
- *Grenades à Fusil Antichar Modèle 1950 , 1952* Ministère de la Défense Nationale, 1952
- *Grenades à Fusil Anti-personnel Modèle 1952* Ministère de la Défense Nationale, 1952
- *Les Grenades à Fusils Françaises* Patrice Delhomme. Gazette des Armes No 118, 1983
- *Grenade à Fusil Modèle 1948* Ministère de la Défense Nationale, 1949
- *Guide Technique des FSA 49-56 et 49-56 M-SE* MAT 1032, 1974
- *Guide Technique Sommaire des Grenades à Fusil Antipersonnel* MAT 1106, 1962
- *Guide Technique Sommaire de la Grenade à Fusil Fumigène de 50mm Modèle F1* MAT 2424, 1968.
- *Guide Technique Sommaire de la Lunette de Tir Modèle 1953* MAT 1853, 1967
- Historical placque concerning Manufacture Nationale d'Armes de St-Etienne and its Museum. Daniel Ploton. MAS, St-Etienne
- *Honour Bound—The Chauchat Machine Rifle* Gerard Demaison and Yves Buffetaut. Collector Grade Publications Inc, Cobourg, Ontario, 1995.
- *Instruction Provisoire sur le Fusil Automatique Modèle 1917* Ministère de la Guerre. *Imprimerie Nationale*, Paris, 1918.
- *Instructions Somaires sur le Fusil Meunier A6 Modèle 1916* December, 1917.
- *Instruction sur l'Armement et le Matériel de Tir* Ministry of War, Paris 1940.
- *Manuel de Reparation des Fusils Semi-Automatiques MAS 49, MAS 49-56 et MAS 49-56 M SE* Direction Centrale du matériel de l'Armée de Terre. (MAT 1178), 1973
- *La Manufacture Nationale d'Armes de Châtellerault* Claude Lombard. Brissaud, Poitiers, 1987
- *Les Matériels de l'Armée de Terre Française 1940* Stéphane Ferrard. Lavauzelle, Paris-Limoges, 1982
- *Nomenclatures des Matériels des Armées - Fusil semi-automatique MAS 49* MAT 1207, 1951
- *Notices sur les Grenades à Fusil Françaises et sur leurs Matériels de Lancement INF 126, 1957.*
- *Notice Technique d'Utilisation et Entretien de l'Equipement de Tir de Nuit pour Fusil Semi-Automatique Modèle 1949-56* 1961.
- *Notice Technique Provisoire de la Carabine MAS 1949*
- *Notice Technique Provisoire de la Carabine MAT 1950*
- Patents from the *Institut National de la Propriété Industrielle*, Paris.
- *Le Pistolet Clair* Jean Huon. *Cibles* No 186, 1985
- *La Poudre Sans Fumée et ses Consequences Tactiques* Colonel 'B'. Librairie Furne et Jouvet, Paris 1890.
- *Les Premiers Fusils Semi-Automatiques Français 1897-1918* G Demaison & M Moy. *Les Arquebusiers de France* No 4, 1964.
- *Les Premières Winchester Automatiques. Cibles* No 130, 1981
- *Recueil de Resumés d'Instruction Militaire Elementaire* Chef de Bataillon Royer & Capitaine Millet. La Renaissance, Troyes 1964.
- *Repetier und Automatischer Handfeuer Waffen der Systeme Ferdinand Ritter von Mannlicher* Konrad Edle von Kromar, Wien 1900.
- Report on Visit of Lord Cottlesloe with Mr J Beavon (CISA) to France, July 2nd to 10th 1918.
- *Revue d'Artillerie* 1902-1911.
- *Un Siècle d'Armement Mondial* Jean Huon. Crépin-Leblond, Paris, 1976; 1981.
- *Small Arms of the World* WHB Smith & Joseph E Smith. Stackpole Books, Harrisburg, Pennsylvania, 1969
- Small Arms Committee Minute 151: *Faucon Automatic Rifle* November 13th, 1918
- Trials Reports from the *Centre d'Archives de l'Armement de Châtellerault* (French and foreign arms experiments from 1894 to 1961)
- *La Vie Passionnante de John Moses Browning* FN Herstal, 1978

By the Same Author:

- *Les Armes Allemandes* CEPADUES, Toulouse, 1993
- *La Carabine US M1* Crépin-Leblond, Paris, 1984
- *Les Cartouches Françaises de 7.5mm* Multi-Arms, Rambouillet, 1985
- *Les Cartouches pour Fusils et Mitrailleuses* AMPHORA, Paris, 1986
- *Les Fusils d'Assaut Français* Histoire et Collections, Paris,1995
- *Military Rifle and Machine Gun Cartridges* Ironside International Publishers, Alexandria, VA USA, 1988
- *Le M16* Crépin-Leblond, Paris, 1983
- *Les Pistolets Automatiques Français 1890 - 1990* Histoire et Collections,Paris, 1994
- *Les Pistolets Mitrailleurs Thompson* Barnett Editions, Evry, 1995
- *Un Siècle d'Armement Mondial* Crépin-Leblond, Paris, 1976 - 1981 (four volumes)
- *Tout Savoir sur les Pistolets Français Civils* SOFARME, Versailles, 1980
- *Tout Savoir sur les Pistolets Français Militaires* SOFARME, Versailles, 1980
- *L'U S M1* Crépin-Leblond, Paris, 1992

In Collaboration:

- *Du Lefaucheaux au FAMAS* (with Jean-Claude Schlinger). Barnett Editions, Evry, 1994
- *Liste des Cartouches par Catégories* (with Jean-Claude Schlinger). Barnett Editions, Evry, 1994
- *Military Handguns of France 1858 - 1950* (with Gene Medlin). Excalibur Publications, Latham, NY USA, 1993

Translation and Adaptation of American Titles:

- E J Hoffschmidt: *Tout Savoir sur le Garand M1* SOFARME, Versailles, 1980
- E J Hoffschmidt: *Tout Savoir sur les Pistolets Colt* SOFARME, Versailles, 1979
- E J Hoffschmidt: *Tout Savoir sur le Pistolet P38* SOFARME, Versailles, 1979